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# **Research Design and Development Facilities**

Research, Design & Development Committee

Punjab, Himachal Pradesh and Chandigarh U.







**RESEARCH  
DESIGN AND  
DEVELOPMENT  
FACILITIES**

Research, Design & Development Committee  
Punjab, Himachal Pradesh and Chandigarh U. T.

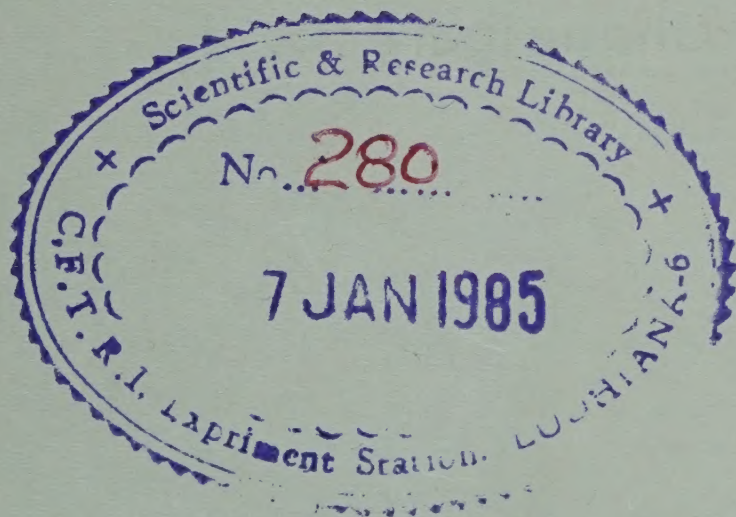
CENTRAL SCIENTIFIC INSTRUMENTS ORGANISATION  
Sector 30, Chandigarh-160020



Compiled by:

S M Sharma  
Information Officer  
CSIO, Chandigarh

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## FOREWORD

In pursuance of the recommendations of the seminar on 'Science and Technology in Small Scale Industries' organised jointly by the Development Commissioner, Small Scale Industries and the Federation of Association of Small Scale Industries held in May 1973, and also in keeping with a similar suggestion put-forward by the NCST Panel on Small Scale Industries, the Department of Science & Technology and the Council of Scientific & Industrial Research, together set-up in the country seventeen State Research & Development Committees to solve the technical and engineering problems posed by the small industries.

These Committees were seventeen only because there were seventeen Small Industries Service Institutes in the country, whose Directors were nominated to act as conveners of these Committees. This number has changed to eighteen now. The Directors of national laboratories are the Chairmen, and the Directors of Industries of the States are vice-Chairmen. Other members of these Committees are drawn from National Laboratories, NRDC of India, Engineering & Technical Colleges, IITs, Small Industries, States Directorates of Technical Development and of Industries, etc. Regions not covered by SISIs have been given representation in the nearest neighbouring R&D Committees.

The Committee under the Chairmanship of Director, CSIO, Chandigarh covers the States of Punjab, Himachal Pradesh and Union Territory of Chandigarh. Representative of SIMDA, Ambala, has been coopted as an invited member.

The main function of this Committee, as that of others, is to receive and scrutinize the problems of research, design, development and machine tool operation schedules, product development etc., posed by the small scale industries in their respective areas of interest-manufacturing techniques or production and as far as possible find solutions to these with the assistance of members on the Committee and their institutions. It also examines, and if there is need, refers such problems for solution to other national laboratories, engineering colleges, or technical institutions elsewhere in the country, wherever the necessary expertise is likely to be available. The Committee may also help smaller entrepreneurs in enunciating the problem more clearly.

The range of small scale industry is itself very wide covering various fields, such as, sewing machines through bicycles, chemicals, electrical appliances and machinery, metallurgical, machine tools, sports goods, preserved foods, watches etc. to components of a large varieties; Quite often, the small entrepreneurs are not conscious of the weakness of their product or technology. If they are, they are sometimes not able to enunciate the problem clearly. The result is that they keep on using ad hoc or even obsolete methods and designs in their manufacturing activity. With increasing competition not only the progress of such industry, even their survival get threatened. The small scale entrepreneurs are, therefore, welcome to avail the facilities offered by the State RD&D Committee for solving their small technical problems. (The medium scale industry is, however, not precluded from sending their problems to RD&D Committee.)

In several meetings of this RD&D Committee, it was expressed that knowledge of the facilities for R&D available in the Engineering Colleges,



CSIO, SISIs, University Departments and other technological institutions would be worthwhile. It could help in referring the problems of the small scale industry more appropriately to the right institutions to elicit appropriate solutions. It was, therefore, decided to compile and print an informative booklet for distribution.

The first booklet was brought out in 1975 and was found useful. Since then, this R&D Committee has also gained experience in handling the problems referred to it. It, therefore, felt that a revised booklet be printed in order to help continue to derive the benefit of most of the facilities offered by various organisations some of which were not included in the earlier booklet.

I am happy to say that this revised edition contains information about not only some of the other institutions or establishments like SISIs, the Experiment Station of the CFTRI, Field Stations of NML, PAU, NRDC, the ETDC and the National Institute of Design where R&D facilities are available and which can be utilized by the small scale industrialists to their best advantage but also mentions under General Information the Quality Marking and Service Centres in Punjab, lists of Industry Associations in Punjab, Union Territory of Chandigarh and Himachal Pradesh.

It will be appropriate to also mention here that any help or assistance offered by the institutions is voluntary and not binding. The exact mode of obtaining the assistance is to be negotiated with the institution concerned directly or through this Committee.

I hope this document will serve as a guide to the small scale entrepreneurs and those officials engaged in helping the small industry for seeking appropriate help as and when required. This can also be a good source of information to various Directorates and Institutions particularly in the regions covered under this Committee.

*H. Vardhan*

HARSH VARDHAN



## LIST OF R & D MEMBERS

1. The Director of Industries  
Punjab  
Chandigarh 160017
2. The Managing Director  
Punjab Financial Corpn.  
Chandigarh.
3. The Director of Industries  
Himachal Pradesh  
Simla.
4. Dr ML Jain  
Principal  
Thapar Institute of Engg. &  
Technology  
Patiala.
5. Dr OS Sehgal  
Punjab Engg. College  
Chandigarh.
6. Shri BK Mehan  
Managing Director  
NCI (P) Ltd.  
105 Industrial Area  
Chandigarh 160002
7. Dr PK Aditya  
Director (Electronics)  
Chandigarh Small Industries  
Corporation Ltd.  
Sector 7-C (Madhya Marg)  
Chandigarh.
8. Shri BM Singh  
Executive Director  
Travelmatics (P) Ltd.  
152 Sector 9-B  
Chandigarh.
9. National Research Dev.  
Corpn. of India  
61-Ring Road  
Lajpat Nagar-III  
New Delhi 110024
10. The Director of Technical  
Education (Punjab)  
'Amar Building' Sector 7-A  
Chandigarh.
11. Shri DM Mathur  
Development Manager  
Small Industries & Small  
Business Banking  
State Bank of India  
Post Box No. 398  
Parliament Street  
New Delhi 110001
12. Shri HK Vyas  
Chairman  
National Institute of Design  
Paldi  
Ahmedabad (Gujarat)
13. The President  
Scientific Instruments  
Mfrs. & Dealers' Assn.  
C/o Modern Equipment Co.  
Ambala Cantt.
14. Shri Narinder Singh  
Assistant Educational  
Adviser (Technical)  
Ministry of Education &  
Social Welfare  
Northern Regional Office  
7/169 Swarup Nagar  
Kanpur (U. P.)
15. Shri PS Bajwa  
Senior Project Officer  
Punjab State Industrial  
Development Corpn. Ltd.  
Sector 17-A  
Chandigarh.
16. Dr B Ghosh  
Head of the Deptt. of  
Chemical Engg. & Tech.  
Panjab University  
Chandigarh.
17. The Managing Director  
State Bank of Patiala  
The Mall  
Patiala.
18. Shri Hardyal Singh  
Scientist-in-Charge  
MERADO Centre  
Gill Road  
Ludhiana.



19. Shri DV Bhatia  
Managing Director  
Chandigarh Small Industries  
Development Corpn. Ltd.  
Sector 7-C (Madhya Marg)  
Chandigarh.
20. Dr JS Pruthi  
Project Coordinator  
CFTRI Experimental Station  
Gill Road  
Ludhiana.
21. Shri PS Grewal  
Principal  
Guru Nanak Engg. College  
Ludhiana.
22. Shri SS Mavi  
Industrial Adviser  
Directorate of Industries  
Punjab  
Chandigarh.
23. Dr SC Seth  
Member-Secretary  
NCST Panel on SSI  
'Technology Bhavan'  
New Mehrauli Road  
New Delhi 110029
24. The Home Secretary &  
Director of Industries  
Union Territory  
Chandigarh.
25. The Director  
Small Industries Service  
Institute  
Solan (HP)
26. Shri BS Pathak  
Dean  
College of Agricultural Engg.  
Punjab Agricultural University  
Ludhiana.



**CSIO**

**Central Scientific Instruments Organisation  
Sector 30, CHANDIGARH**



The Central Scientific Instruments Organisation (CSIO) located at Chandigarh is an institute for research, design and development of scientific and industrial instruments by utilising as far as possible indigenous components and materials. It assists industry, defence, educational institutes and government establishments; provides facilities for testing and calibration of electronic, electrical and optical instruments/components; conducts reliable repair and maintenance service of instruments; trains instrument technicians, technologists, scientists and engineers; and communicates technical information on topics relevant to scientific and industrial instruments.

*For further details, please contact :*

**INFORMATION OFFICER**

**Central Scientific Instruments Organisation**

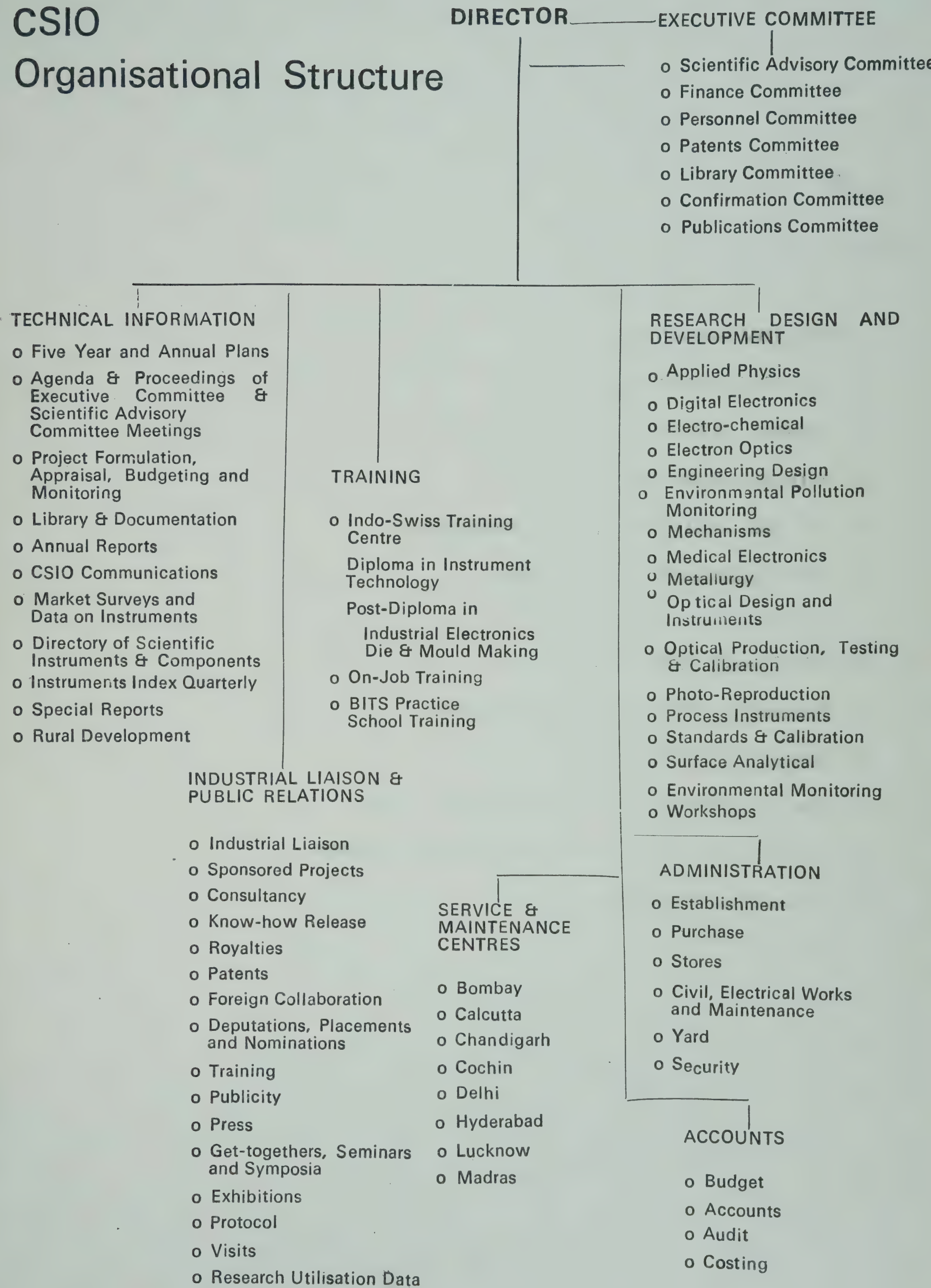
**Sector 30, CHANDIGARH-160020**

*Grams : CENINSTS Tel. No. : 25663 Telex : CSIO 300 CH*



# CSIO

## Organisational Structure





**C S I O**

*offers*

1. **KNOW-HOW in the following areas :**
  - (a) **MEDICAL INSTRUMENTS**
  - (b) **DIGITAL ELECTRONICS INSTRUMENTS**
  - (c) **PROCESS CONTROL INSTRUMENTS**
  - (d) **OPTICAL INSTRUMENTS & COMPONENTS**
  - (e) **METALLURGICAL INSTRUMENTS**
  
2. **CONSULTANCY SERVICES for :**
  - (a) **Preparation of Feasibility/Project Reports**
  - (b) **Design Engineering**
  - (c) **Erection, Commissioning and Operation of Plant**
  - (d) **Examining and Advise on Trouble Shooting Problems**
  - (e) **General Technical Consultancy**



## Research, design and development at CSIO

Applied physics	scanning electron microscope metal spectroscope X-ray spectrometer atomic absorption spectrophotometer
Digital electronics	data processing systems digital measuring instruments/systems programmable digital testing systems agro/dairy electronic instruments
Electro-chemical	foam level controller infrared moisture analyser pH meters and controllers water analysis kit temperature controller auto analyser
Engineering design	fine mechanisms pressure sensors displacement transducers industrial design
Medical electronics	biosignal recording and display dialysers and kidney machines environmental chambers diagnostic ultrasonics X-ray image intensification patient monitoring & automation
Metallurgy	metallurgical instruments powder metallurgy products chemical standards special alloy castings
Optics	lens systems design optical systems design graticules & scales evaluation of optical components and systems thin film optics optical instruments optical workshop techniques plastic optics fibre optics
Photo-reproduction & printing	photo-chemical and photo-mechanical techniques for printed circuits fine scales and dials panels and labels printing and publishing of documents
Process instruments	electromagnetic flow meter digital tachometer and speedometer stepper motors, micro motors oxygen analyser



	Surface analytical	electron spectroscopy for chemical analysis Auger electron spectrometer electron and ion guns metal-ceramic ultra high vacuum shielding equipments
	Environmental Monitoring	Instruments for Pollution Measurements
	Workshops	mechanical design machine tool shop high precision workshop fitting, surface finishing, welding, woodwork model making, plastic moulding
	Repair and maintenance	repair of instruments contract maintenance service of instruments mobile service for repair of instruments
	Technical assistance	heat treatment, chemical & spectrochemical analyses, mechanical testing, metallographic evaluation, melting & casting microfilming, photocopying, printing specialised optical workshop jobs workshop metrological services testing, calibration and evaluation of instruments
	Training	diploma in instrument technology post-diploma in industrial electronics post-diploma in die and mould making on-job training BITS practice school training
	Technical information & co-ordination	five year and annual plans agenda & proceedings of executive committee & scientific advisory committee meetings project formulation, appraisal, budgeting and monitoring library & documentation annual reports, special reports market surveys and data on instruments Directory of Scientific Instruments and Components, CSIO Communications
	Industrial liaison & public relations	industrial liaison, sponsored projects consultancy, know-how release, royalties, patents, foreign collaboration, protocol deputations, placements and nominations training, publicity, press, get-togethers, seminars, symposia, exhibitions, visits research utilization data
	Survey of rural resources and development	surveying of rural resources, identifying the problems and possibilities rendering technical assistance, consultancy and advice, etc



**Directory of Scientific Instruments & Components  
Manufactured in India  
[ 1977 Edition ]**

Published by Central Scientific Instruments Organisation has been designed to serve a wide spectrum of users:

- To the buyer of an instrument or component this Directory provides information about the manufacturer/s who can meet his requirement fairly and sharply.
- To the manufacturer of an instrument or component the Directory acts as a medium of sales promotion by bringing his products in the knowledge of potential customers. The manufacture will also know who others are making the same item.
- To the new entrepreneur intending to enter instrument industry the Directory assists in identifying the programme. He will also know his potential competitors and their areas of operation.
- To the policy maker intending to have a glance at the overall picture of instrumentation in the country the Directory serves as a reliable source of information.
- To the market researcher this Directory serves as a ready reference and facilitates his task considerably.

The Directory is ready for sale and its price in India is Rs. 100/- including packing and forwarding charges.



**CSIO Service and Maintenance Centres**

<b>Scientist-in-Charge</b> <b>Service &amp; Maintenance Centre</b> CSIR Complex 2nd Floor NPL Campus Hillside Road NEW DELHI-110012 Phone : 586794	<b>Scientist-in-Charge</b> <b>Service &amp; Maintenance Centre</b> Sector 30 CHANDIGARH-160020 Phone : 24614	<b>Scientist-in-Charge</b> <b>Service &amp; Maintenance Centre</b> CSIR Campus Merado Bldg Adyar MADRAS-600020 Phone : 412061
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<b>Scientist-in-Charge</b> <b>Service &amp; Maintenance Centre</b> I.I.E.M. Campus (2nd Floor) 4, Raja Subhash Mullick Road Jadavpur CALCUTTA-700032 Phone : 425412	<b>Scientist-in-Charge</b> <b>Service &amp; Maintenance Centre</b> Osmania University Campus HYDERABAD-500007 Phone : 71761	<b>Scientist-in-Charge</b> <b>Service &amp; Maintenance Centre</b> Sahaka Bhuvan Kurla Industrial Estate Ghatkopar BOMBAY-400086 Phone : 551994
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<b>Scientist-in-Charge</b> <b>Service &amp; Maintenance Centre</b> III Hostel Building Lucknow Polytechnic Kanpur Road LUCKNOW-226005 (UP) Phone : 51302	<b>Scientist-in-Charge</b> <b>Service &amp; Maintenance Centre</b> CSIR Cochin Complex S Kalamassery COCHIN-683104 Phone : 5790	<b>Scientist-in-Charge</b> <b>Service &amp; Maintenance Centre</b> SMS Medical College Campus JAIPUR-302004
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## **The Centres**

Repair and maintenance of instruments is one of the important services the Central Scientific Instruments Organisation offers to the users of instruments in the country. The service is offered, at the present, through its nine Centres functioning at Bombay, Calcutta, Chandigarh, Cochin, Delhi, Hyderabad, Lucknow, Madras & Jaipur. A few New Centres in other important cities are expected to be started in the near future.

A large variety of instruments are serviced by these Centres. These are either indigenous or imported and range from mechanical through optical, electrical to electronics, primarily the latter coming from hospitals, industries and educational institutions.

The effort involved in such repair and maintenance is uncertain, being a function of the process of detection of the fault, availability of replacement components and the testing and calibrating procedures, etc. Even though a stock of components is maintained at the Centres often these are not readily available for a specific job and are to be procured or imported. It takes time. It also requires a team of well-trained, experienced and qualified technologists. In spite of this, the charges are highly subsidised and depend upon the national benefits accruing through the use of the operative instruments by the doctors for the benefit of the patients, by the industry in control of the processes and by educational institutions for teaching and training which are considered more important than levying total cost charges by the Organisation and likely to act as deterrent to many a customer.

Besides this service, the Centres also impart 'on-job' training to engineers and technicians sponsored by various Organisations. This is done in order to provide the ability and the cult of repair and maintenance—a specialised trade to suitably qualified persons in an attempt to spread this far and wide.

These Centres have been rendering commendable service to a large number of hospitals, industries and educational institutions in addition to helping sister Organisations in the CSIR.

Whenever required, the Centres also undertake small development projects against specific requirements.

This little leaflet is to acquaint the reader with the Centres and to guide him for availing the excellent services. Users of the instruments looking for dependable service could make contact with the respective Centre nearest to the area or the Information Officer, Central Scientific Instruments Organisation, Sector 30, Chandigarh-160020.

## **Facilities**

Electronic, electrical, electro-mechanical, medical and optical instruments are entertained at the Centres. The main objective is to provide the instrument users with efficient, expeditious and economical repair and maintenance facilities.

In order that the instruments serviced at these Centres operate satisfactorily, tests on accuracy, precision and sensitivity are carried out with the help of standard instruments and equipment, wherever required.

Maintenance and servicing of instruments is also undertaken on contract basis. Under this scheme the instruments are checked up at regular intervals, and repair work is



carried out whenever any breakdown is reported by the contracting party. Please contact the Scientist-in-Charge of the nearest Service and Maintenance Centre for terms and conditions of contract servicing.

Often when the instrument under repair is old and replacement components are not available, the highly qualified and experienced staff of the Centres duly studies the circuit and brings about the necessary changes in the circuit to obtain required functions through available components; sometimes substituting one critical component with a combination of several components.

When a particular type of equipment fails again and again and the failure is of the same type, necessary modifications are brought about to stop its further recurrence. Such a situation is common in equipment not meant for tropical climates.

The Centre at Chandigarh has the additional provisions for the repair of mechanical and optical aspects of the instruments through sophisticated and specialized facilities of the main laboratories and overall expertise available there. This Centre takes help of the main workshops, comparison standards and calibration equipments etc. available in other divisions. The other Centres also utilise these facilities, if required, by referring their jobs to CSIO Chandigarh.

The scientific and technical staff members of the Centres are constantly updated through dialogue with scientists of the main laboratories, through their placements for training in other institutions and abroad and participation in symposia and workshops, so that the quality of the services offered by the Centres is always the best.

### **Who can draw upon the services**

All public and private institutions and establishments are eligible.

### **How to use the services**

- O The instrument sent for repair should preferably be accompanied with the instruction manual, circuit diagrams etc. (returnable) and a brief description of the nature of the defect noticed by the user.
- O Due to varied nature of faults in the instruments, it is not possible to give estimates of repair jobs, and to work against any deadline for delivery.
- O The instruments are accepted and delivered at the Centres only.
- O The instruments are to be collected promptly on receipt of intimation from the Centres.
- O The instruments should be checked and payments made before taking delivery after repairs.
- O Charges are based on the cost of labour and components required for the job and are individually estimated.



- O The Centres make every effort to procure replacements components when not already in stock but take no responsibility for non-availability or delays beyond their control. Customers are requested to help, if possible.
- O The Centre reserves the right to accept or to refuse or to return without repairing any instrument sent for repairs with no obligation to explain.
- O While every care is taken, the Centres cannot accept any responsibility for loss or damage caused to the instruments submitted for repairs due to circumstances beyond their control.
- O No claim for expenses or loss of time incurred before or after the submission of instruments for repair will be entertained.
- O The bills, when made out, are to be paid in full, by means of demand draft on the State Bank of India, drawn in favour of the Director, Central Scientific Instruments Organisation, Chandigarh.
- O In case of any dispute the decision of the Director, Central Scientific Instruments Organisation, Chandigarh shall be final and binding.



## CSIO OFFERS FACILITIES IN THE FOLLOWING FIELDS

### Service and Maintenance of

Electrical, electronic, electromechanical, optical and medical instruments of different nature and specifications.

### Calibration and Testing of

Current transformers, electrical indicating instruments; apparatus comprising resistors; potentiometers; thermocouple pyrometers; dc moving coil galvanometers; insulation resistance testers; power supply units; voltage stabilizers; counters and time interval meters; oscilloscopes; frequency meters; signal sources etc. and tests on climatic and durability characteristics.

### Foundry and Metallurgical

Casting of cast iron, steels, aluminium and copper base alloys; heat treatment-case hardening, hardening, annealing, normalizing etc; mechanical testing-tensile strength, hardness testing in various scales and microhardness testing; metallographic evaluation of ferrous and non-ferrous metals and alloys; dilatometric tests; chemical and spectrochemical analysis of ferrous and non-ferrous alloys.

### Optical Industry

Curve generating, centering, edging and blooming, designing of optical systems; fabrication of optics; inspection of indigenous optical instruments/components for quality improvement and advice on standardization; training of limited number of technicians in testing, repair, assembly and use of optical instruments and optical glass working; assistance on any other technical point connected with optical instruments/components industry.

### Metrology

Testing and calibration of micrometers, dial gauges, vernier callipers, straight edges, precision squares and surface plates, spirit levels, clinometers, cylindrical plugs, rings and thread gauges, length bar and its accessories, angle gauges and sine bars, dividing heads, plug and ring tapers and bourdon type pressure gauges.



# Evaluation, Testing and Calibration of Products and Technical Assistance

## What we can do...

We are here to help you in solving most of your evaluation and testing problems related to scientific and industrial instruments, process control instruments and components.

If you happen to be a manufacturer, a dealer or a consumer of such items, we can evaluate them for you as per international or Indian Standards or as per manufacturer's specification.

A faulty instrument, say a pressure indicator or a temperature indicator and controller in your plant can cause a big loss to you. This can be prevented by periodic checks and calibration by us.

Purchase of substandard instrument and components can be prevented if a few samples are tested before accepting the same. You don't have facilities to test all the material you purchase. We can help you in testing them.

To have a good business get your product tested before you submit samples and quotations to the bulk purchasers. Otherwise you may be disappointed at the last moment for minor things and loose a big business.

## Evaluation

Evaluation of an instrument involves comprehensive testing. It gives maximum information about the characteristics of the instrument. The evaluation programme generally consists of :

- \*Steady-state performance tests under reference operating conditions.
- \*Performance tests at specified limits of temperature, pressure, humidity etc.
- \*Effects of mechanical disturbances such as shock and vibration.
- \*Effect of electrical disturbances like power supply variation, interruptions and interference.
- \*Dynamic performance test.
- \*Simulated long term stability and life tests.
- \*Assessment of construction, installation and operating hand-book.

When you want to save on time and money, specific testing, not as comprehensive as full evaluation, is also undertaken. Only those tests as desired by you are performed. This type of limited testing is very useful when the product is in the development stage or the user is interested in some specific test only.

The environmental and other test facilities available are :

- |  |   |
|--|---|
| <input type="checkbox"/> Temperature : Dry cold severity.<br>Temperature range : ambient to a minimum of $-20^{\circ}\text{C}$   | <input type="checkbox"/> Rapid Change of Temperature :<br>From $+100^{\circ}\text{C}$ to $-20^{\circ}\text{C}$ in 3 minutes                               |
| <input type="checkbox"/> Temperature : Dry heat severity.<br>Temperature range : ambient to a maximum of $+100^{\circ}\text{C}$  | <input type="checkbox"/> Mould Growth :<br>Temperature range : $25^{\circ}\text{C}$ to $-30^{\circ}\text{C}$<br>Relative Humidity : 95—98 %               |
| <input type="checkbox"/> Temperature-Humidity : Long term<br>Temperature range : $40^{\circ}\text{C}$<br>Relative Humidity : 90% to 100%                                 | <input type="checkbox"/> Sand & Dust :<br>Temperature : ambient to $40^{\circ}\text{C}$<br>Intensity : 25 gms $\pm$ 5 gms of Silica-sand deposit in 5 min |
| <input type="checkbox"/> Temperature-Humidity : Accelerated Test<br>Temperature range : $25^{\circ}\text{C}$ to $55^{\circ}\text{C}$<br>Relative Humidity : 95 % to 100% | <input type="checkbox"/> Salt Mist Test : As per IS : 589   |
|  | <input type="checkbox"/> Bump :<br>Bump rate : 2-3 bumps per second<br>Loading Capacity : 22.7 kg.  |
|  | <input type="checkbox"/> Vibration resonance search and fatigue testing.  |



Mode of vibration : Sinusoidal  
 Frequency range : 3 Hz to 30 KHz  
 Capacity : 18 kg. Thrust.

- ☐ Shock :
 

Light weight mechanism to simulate shocks which result from packages being suddenly dropped from a height.

## Calibration

You are aware that accuracy check after repairs or replacement of component and periodic calibration for all the measuring instruments in a plant is a must in order to maintain the quality and to reduce the number of rejection in the final inspection. We can solve most of your calibration problems.

The evaluation, testing and calibration work are treated as CONFIDENTIAL and the results are given in the form of a TEST REPORT to the sponsoring client and to those whom the client wishes.

The measurement facilities available are :

<i>Parameter</i>	<i>Frequency</i>	<i>Accuracy</i>
<b>D. C. Resistance</b>		
1m $\Omega$ to 191m $\Omega$	D. C.	$\pm 0.05\%$ to 1% depending upon range
<b>A. C. Resistance</b>		
1m $\Omega$ to 11m $\Omega$	up to 10KHz	$\pm 1\% \pm 1\text{m}\Omega$
10 $\Omega$ to 10K $\Omega$	up to 10KHz	$\pm 0.5\%$
<b>Inductance</b>		
1 $\mu$ H to 1100H	up to 10KHz	$\pm 1\% \pm 1\mu\text{H}$
1mH to 10H	up to 10KHz	$\pm 0.5\%$
<b>Capacitance</b>		
1pF to 1100 $\mu$ F	up to 10KHz	$\pm 1\% \pm 1\text{pF}$
1nF to 10 $\mu$ F	up to 10KHz	$\pm 0.5\%$
<b>Voltage</b>		
10 $\mu$ V to 1.8V	D. C.	$\pm (0.0005\% \pm 0.1\mu\text{V})$
1.8V to 1KV	D. C.	$\pm 0.001\%$
500V to 12KV	D. C.	2%

0.5V to 1KV	5Hz-20KHz	$\pm 0.01\%$ to $\pm 0.02\%$
0.5V to 1KV	20-50KHz	$\pm 0.01\%$ to $\pm 0.04\%$
0.5V to 1KV	50-100KHz	$\pm 0.05\%$ to $\pm 0.5\%$
0.5V to 50V	100-500KHz	$\pm 0.1\%$
0.5V to 10V	0.5-1MHz	$\pm 0.1\%$
500V to 12KV	50-100Hz	$\pm 2\%$

## Current

1nA to 0.1mA	D. C.	2% of actual value $\pm 0.2\%$ of F. S. D.
10 $\mu$ A to 25A	D. C.	$\pm 0.05\%$
5mA to 25A	5-50KHz	$\pm 0.05\%$
10mA to 50A	50-100Hz	$\pm 0.1\%$

## Power

0 to 2400W	D. C. & 50-100Hz	$\pm 0.25\%$
0 to 3000W	D. C. & 40-500Hz	$\pm 0.1\%$
0.1mW-20W	50Hz-20KHz	$\pm 8\%$

## Power Factor

0.4 lag-unity —0.4 lead	50-100Hz	$\pm 1\%$
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## Insulation Resistance

<i>Measuring Range</i>	<i>Voltage</i>
up to 500 M $\Omega$	500V
up to 1000 M $\Omega$	250V
up to 10 <sup>6</sup> M $\Omega$	100V
up to 10 <sup>5</sup> M $\Omega$	10V

High Voltage tests can be carried out up to 5KV A.C./D.C.

<i>Temperature</i>	<i>Accuracy</i>
0°-300°C	$\pm 0.2^\circ\text{C}$
300°-800°C	$\pm 2^\circ\text{C}$

## What the service costs :

The cost of evaluation, testing or calibration depends upon the instrument and upon the tests carried out. The charges are intimated and agreed upon before the work is started.

## Small Scale Industries

If your's is a registered small scale industry, please ask us for a 33 $\frac{1}{3}\%$  discount on charges for testing of your products.



# MERADO

Mechanical Engg. Res. & Design Orgn.  
Gill Road, LUDHIANA



## **FUNCTIONS**

The basic functions of the MERADO Centres are :

To undertake surveys for assessing demands of products of the engineering industries in various consumer branches, and on the basis of these surveys to prepare a phased programme for development of various local industries ;

To carry out research and development in the manufacture of better quality products through improvement over the existing designs, development of new designs, optimum utilisation of materials and substitution of imported material by indigenous ones;

To help local industries increasing productivity through better production methods, better utilisation of machinery and their correct maintenance, standardisation and improvement in production, lay out and materials handling;

To provide developmental evaluation facilities, and assist the industries in developing their testing and control systems etc.

## **FACILITIES AVAILABLE**

Design, development and standardisation of :

Industrial machinery and equipment.

Farm machinery and equipment.

Technical guidance in Foundry Technology

Hydraulic pumps.

Jigs, Fixtures, Tools and Gauges.

Evaluation :

**Destructive Testing :**

Tensile tests with stress strain curves.

Compression tests.

Transverse tests.

Impact test : Charpy.

Hardness test : Brinnel, Rockwell and Vickers.

Bend tests.

Spring testing.

Scheeroscopic test for rubber and plastic.



**Fluid Mechanics :**

Centrifugal pumps, up to 10 h.p.

Insecticide Sprayers.

**Metrology :**

Measurement of gear parameters.

Linear and angular measurements by optical profile projectors;  
x10, x20, x50, x100.

Measurement of external and internal cams.

Alignment of machine beds.

Surface texture of plain and curved surfaces.

Checking/or calibration of micrometers, straight edges, precision squares, surface plates, precision spirit levels, cylindrical plug gauges and ring gauges, parallel screw plug gauges and ring gauges, length bars and accessories, dial gauges and test indicators, vernier calipers, vernier height gauges, sine bars, dividing heads and pressure gauges (up to 1000 psi).

**IC Engines :**

Performance and endurance tests on diesel engines as per IS : 1600 and IS : 1601.

**Non-destructive testing :**

Penetrants/Magnetic particle testing of welded joints, castings and forgings.

Radiography of welds, castings, forgings with or without interpretation.

Interpretation of radiographs supplied by firms.

Ultrasonic testing of welds, castings, forgings and plates.

Ultrasonic thickness survey.

Crack depth detection.

Coating thickness measurements on ferromagnetic base.

Chemical Analysis : Ferrous & Non-Ferrous materials.

Preparation of feasibility and project reports for light and medium engineering industry.

Industrial consultancy on production problems.

A well equipped Drawing Office.

Workshop suitable for fabrication of prototype.

Jig boring.

Library with facilities for technical information, patent inspection, I. S. Specifications and other standard codes.

*For details please contact :*

Scientist-in-Charge  
MERADO  
Gill Road  
Ludhiana







PEC

Punjab Engineering College  
Sector 12, CHANDIGARH



## CIVIL ENGINEERING DEPARTMENT

The Department of Civil Engineering can offer facilities in various areas like structural Engineering, Soil Mechanics and Foundation Engineering, Highway Engineering, Irrigation and Hydraulics Engineering, Public Health Engineering, Surveying etc. The information given below lists some of these facilities under different subheads:

### Structural Engineering :

Design of structural of Concrete, Steel, Masonary and timber e. g. Shell Structures, Folded Plates, Pre-stressed Concrete Structures in Building, Bridges and Transmission Poles, Water Reservoirs, Masonary Retaining walls etc. Computer Programming for design of various types of Structures can also be undertaken.

Optimum design of concrete structures of various strengths especially the design of High Strength Concrete mix for use in pre-stressed Concrete.

Experimental Stress Analysis Studies using Photo-elastic techniques for complicated two and three dimensional structures.

Testing facilities for the following as per ISI specifications :

- a. Reinforced and Non-reinforced Cement Concrete and Cement asbestos pipes of various diameters for three edge bearing test.
- b. Pre-stressed Concrete poles.
- c. Reinforced Cement Concrete beams, up to a span of 6 meters.

Experimental and analytical Studies for stress concentration can also be made on concrete and reinforced concrete models using Electrical and Mechanical Strain Gauges.

### Irrigation and Hydraulics Engineering :

Studies on hydraulic models of sluices, pen-stock branches, bends etc. for evaluation of their prototype behaviour in hydraulic structures.

Study of erosion, devices to protect against erosion, and energy dissipation. Sedimentation problems in rivers and canals.

Analog and digital analysis of specific ground water and drainage problems.

Determination of fluid dynamic drag and flow induced vibration of structures in wind or water.

Hydrodynamic forces due to earthquakes on storage tanks, dams, bridges etc. (fabrication of a sinusoidal shaking table for testing is being taken up, and analysis can be carried out on IBM 1620).

Network analysis of municipal water distribution (on computer IBM 1620).

Analysis of water hammer in simple and compound pipes, stability analysis of single and multiple surge tanks (if necessary, experiments may also be designed to verify the analysis).

### Highway, Soil Mechanics & Foundation Engineering :

#### Laboratory Testing Facilities

- a. *On Soils* : Routine tests on soils and interpretation of results. Testing facilities are available for particle-size analysis (including Hydrometer



Analysis), Soil classification, moisture content, void-ratio, porosity, degree of saturation, atterberg limits and field density determination, Permeability coefficient, Moisture-density relationship. Box shear tests, unconfined compression test, triaxial testing lab. C. B. R., consolidation tests and laboratory tests on stabilised soil samples.

*b. On Road Aggregates and Bituminous Materials :* Los Angeles Abrasion test, Deval's attrition test, Dorry's Abrasion Test, Crushing strength test and Aggregate Impact Test on Road Aggregates and penetration test, Ductility test, softening point test on Bituminous Binders.

*c. On Bituminous Mixes and Stabilised Soils :* Laboratory tests for the stability of Bituminous mixes, Marshall Hveem, and Hubbard field methods of testing, tests on stabilised soils for road construction.

### **Field Testing Facilities**

Removal of undisturbed samples from the site, standard penetration test, field C. B. R. Plate-bearing tests, vane-shear test, Satch-came penetrometers test, Development of soil profile by electric resistivity meter. Benkelman Beam test for determining the relative value of pavement and subgrade strength.

### **Consultation Services for Analysis/Design of Foundation and Highways**

Consultation can be offered for complete exploration and investigation of site for foundations of Buildings bridges. Highway Laboratory testing, interpretation of test results and recommendations regarding soil strength parameters, bearing capacity and probable settlement for structures like multistoreyed building, bridges, elevated water tanks, road construction in difficult terrain etc. Investigation and stability analysis of hill slopes and earth dams, underground construction and drainage, investigation of stability and the design of foundation of individual footings, shop footings, rafts piles.

Investigation of Highway subgrades. Design of pavement thickness for flexible and rigid pavements for different loadings, foundation and climatic conditions. Analysis and study of soil conditions by Photo-interpretation techniques.

Specialised consultation services are available for conducting Scientific traffic engineering studies e. g. Volume, Speed, Origin, destination, parking and accidents (studies) in connection with traffic engineering problems in the rural and urban areas. Services are offered for the design (and re-design) of intersections, Rotaries, signalised intersection, channelisation etc.) Traffic control devices (Signals and markings) and for providing solution to parking and accident problems.

*Surveying :* The following jobs can be undertaken in the survey laboratory of this College:

Repair of surveying instruments.

Permanent adjustment of levels and theodolites. Consultation facilities can also be offered in preparing topographic maps and contouring etc.

### **Public Health Engineering :**

Facilities in Public Health Engineering laboratory at this college are available for following investigations.



- a. Tests regarding strength of sewage like L. O. D., C. O. S. and suspended solids can be carried out.
- b. Quality of water can be determined with respect to chlorides content, pH value, hardness, optimum alum dose, turbidity of water and residual chlorine etc.

## **ELECTRICAL ENGINEERING DEPARTMENT**

The Department has facilities for testing in the following laboratories :

### **High Voltage Laboratory**

It is a well equipped laboratory containing an impulse generation of 300 KV a sphere gap, automatic oscillographic recording equipment etc. Impulse tests can be carried out on electrical apparatus such as PVC conductors, isolators, transformers, insulator strings and other appliances according to relevant ISI specifications.

Insulation break down tests can also be carried out for transformer oil or any other liquid insulation too.

### **Measurement Laboratory**

It is a good standards laboratory and work on testing of any meters, both A.C./D.C. can be done as per design or ISI specifications. Calibration of various meters is also undertaken. Speciality is in testing energy meters both 1- $\phi$  and  $\phi$ . Type and routine tests can be carried out. Iron testing set for testing of terminations is also available. Both low and high resistance standards can be set up.

### **Machines Laboratory**

We have an excellent machines laboratory which is a nucleus for testing of electrical motors and generators of moderate capacity. Phantom loading is improvised to do full load testing. Induction motors, pumps, transformers, etc. can also be tested. Design work can also be undertaken. Life or accelerated tests can be done on any electrical apparatus such as small chokes, transformers, lamps, household appliances.

### **Power Systems Laboratory**

It is equipped with dynamic testing set and secondary injection testing set for carrying out routine, type or development tests on protective relays.

## **Consultation Service**

1. Feasibility studies for setting up of plants for manufacture of electrical apparatus such as transformers, chokes, motors, previous and other household appliances.
2. Setting up laboratories for quality control and obtaining ICI Marks.
3. Setting up H. V. labs. including design of earthing grid for safety of personnel.
4. Power system planning and design.
  - i. Digital computer load flow studies.
  - ii. Digital computer short circuit studies.
  - iii. Digital computer stability studies.



These studies can lead to proper planning of power system equipment and switch gear and relays for protection.

*Note :* For all types of tests, party can approach the college authorities and due test report will be issued under the seal of the college after the tests have been performed.

## **MECHANICAL ENGINEERING DEPARTMENT**

The Department has qualified staff and well equipped Laboratories to undertake the Testing, Fabrication, Designs or any other consultation in the following fields :

Rotodynamics Machines such as Turbines, Pumps, Compressors and Blowers. Consultation work will include testing of the machines or models as per I. S. I. specification or designing the machines for specific purpose.

Testing facilities for the materials. The laboratory can take up the testing work of any type such as Tensile, Compressor, Bending or Shear.

Internal Combustion Engines of all types such as Diesel Engine, Petrol Engine, Four stroke and Two stroke Engines Consultation work will include testing of engines and its components and design of the machines. The college has also a well equipped Automobile Laboratory, whose facilities can be utilised in the above manner.

The Refrigeration Laboratory is well equipped with various refrigeration appliances such as Hygrometers, Katathermometers, Gas Charging Trolley, Various servicing tools etc. The laboratory offers :

1. a. Testing facilities in Air conditioners, Refrigerators, Deep Freezers, Water Coolers and Gysers.  
b. Refrigerant charging for Refrigerators of all types Air conditioners, Water Coolers, Deep Freezers, etc.  
c. Servicing after detecting the faults such as, leak detection, Frosting, less cooling etc.
2. a. Design of any of the above machines and its components.  
b. Air Conditioning for Domestic and Industrial use including Heat load calculations. Equipment Design and Selection, and Detecting Layout.
3. Calculation of the Optimum temperatures to be maintained for the storage of various foodstuffs.
4. Determination of the coefficient of Thermal Conductivity of various insulating and Building Materials.
5. The department has also a construction Lab. which contains Machinery for Earth Moving Equipment.
6. The department can also take up any work on Production and utilization of Steam and related Machinery such as boilers, steam engine, steam turbine.

## **PRODUCTION ENGINEERING DEPARTMENT**

The Production Engineering Department has the consultancy facilities in the following areas :



Methods Engg. (Motion and Time Study) and Work Sampling.

Production Planning and Control.

Material Handling including design of conveyors and assembly lines.

Automation and Automotive control.

Instrumentation Testing and Inspection Techniques and Statistical Quality Control.

Jigs, Tools, Gauges, Dies and Fixtures Design.

Design of Mechanisms.

Design, Development and fabrication and testing of new products.

Experiments in office organisation, Methods in office working, Sales Planning, Boosting and Advertisement, Market Research and Exploitation.

## **METALLURGICAL ENGINEERING DEPARTMENT**

The Department of Metallurgical Engineering can provide facilities in the following areas of testing/fabrication.

Metallurgical Analysis of Metals.

Metallographic study of Metals.

To design and fabricate the light castings.

To study and guide the welding technology/defects.

## **AERONAUTICAL ENGINEERING DEPARTMENT**

### **Aerodynamics Laboratory**

It is well equipped laboratory consisting of a low speed wind tunnel having test section of  $3' \times 2'$  and Maximum Air speed of 90 Knots. Various tests can be performed to evaluate forces acting on scale models of Aircraft. It can also be used for evaluating wind pressures on non-conventional building shapes. Design and fabrication of wind tunnel balance to measure these forces can also be undertaken.

### **Propulsion Laboratory**

Laboratory is equipped with a piston engine test rig. Specialised consultation on design of Heat Exchangers, Compressors, turbines, flow nozzles and combustion equipment is available.

### **Structural Laboratory**

This laboratory is equipped with strain measuring equipment, stock absorber test rig and wing destruction test rig. Static and dynamic testing of structural elements can be undertaken. Drop testing of shock absorber can also be undertaken.

### **Miscellaneous**

Specialised consultation on aircraft production techniques, simple sheet metal jig and fixtures, heat treatment laboratory equipment etc. is also available.

*For further details please contact :*

Principal  
Punjab Engineering College  
Chandigarh



# CFTRI

*(EXPERIMENT STATION)*

Central Food Technological Research Institute  
Experiment Station  
Gill Road  
LUDHIANA-6  
Tel : 24568



## 1. Introduction

The Central Food Technological Research Institute, Mysore, one of the pioneering National Laboratories under the aegis of the Council of Scientific and Industrial Research, New Delhi established its Regional Research Station in Simla in March 1963. Later, it was re-christened as 'Experiment Station' in 1965. This station is to cater to the technical needs of the Food Industries in the States of Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir and Union Territory of Chandigarh. It continued to function in a portion of the Naubahar building of the Directorate of Horticulture, H. P. Govt. Simla up to 1968. It was shifted to Ludhiana and was temporarily located in a hired building in Guru Nanak Engineering College, Ludhiana. Later, the Punjab Industries Department allocated 5 acres of land on Gill Road, adjacent to MERADO Centre for the CFTRI Expt. Station and constructed a building for the location of the station. It was also furnished with lab. benches, light and fans, etc. The station shifted to this building on 1st February, 1971 and since then, it has been continuing the following technical activities with the ultimate object of serving and developing the Food Industries in the region.

## 2. Main Activities

### *1. Industrial Consultancy*

To render technical assistance to the existing Food Industries in the region (Punjab, Himachal Pradesh, Haryana, Jammu & Kashmir and the Union Territory of Chandigarh);

### *2. R & D Work*

To undertake investigational project-oriented research for providing answers to the technical problems faced by the Food Industries in the region;

### *3. Extension Service*

To make available the technical know-how of the processes and products developed at the CFTRI, Mysore, to the industrialists and entrepreneurs for the quick utilization of the Institute's research findings;

### *4. Liaison*

To become a coordinating link between the CFTRI, Mysore, the State Governments and the Food Industries of the region for ensuring quick research utilization;

### *5. Quality Control (Analysis & Testing of Foods)*

To assist in Quality Control and Standardization of foods with special reference to physical, chemical and microbiological examination of fruit and vegetable products on payment of fees as per schedule of approved charges (Annexure I);

### *6. Survey Reports*

To conduct surveys of raw materials as well as Food Industries to identify R & D problems for research in Food Science and Technology.



### 3. Divisions/Sections

1. Fruit & Vegetable Technology
  - (a) Post-Harvest Technology
  - (b) Processing Technology—Pilot Plant
2. Food Processing—Pilot Plant
3. Industrial Consultancy & Extension Services
4. Library (Food Science & Technology)
5. Admin. Section/Stores etc.

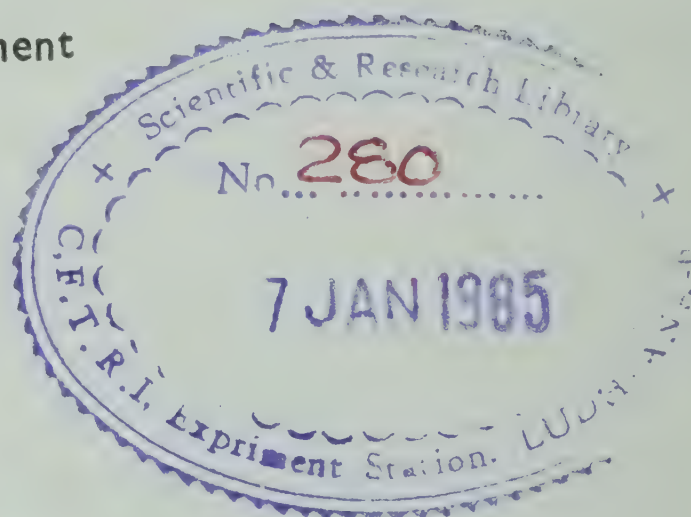
### 4. Laboratory Instruments Available

#### *(A) Quality Control Instruments (For Analysis and Testing of Foods)*

1. Spectro-Colorimeter
2. Photoelectric Colorimeter (Imported)
3. Infrared Moisture Meter
4. Polarimeter
5. Abbe's Refractometer
5. Thin-Layer Chromatographic Equipment
7. Paper Chromatographic Equipment
8. Gas Analyser
9. Electrophoresis Equipment
10. Densitometer
11. Thermohygrograph
12. Hygrometer
13. ELICO pH Meter
14. Televista Electronic Calculator
15. Electronic Analytical Balance (Poland)
16. Electronic Single Pan Balance (Analytical)
17. AIMIL Rotary Viscometer
18. AIMIL Gloss Reflectance Meter (optical accessory spectrophotometer)

#### *(B) Instruments/Equipments for Microbiological Examination of Foods*

1. KICE Binocular Research Microscope (Japan)
2. Electronic Colony Counter





3. TI 90 Incubators (Bacteriological)
4. Autoclave (Electrically heated)

*(C) Other Laboratory Equipments*

1. Basket Centrifuge
2. Automatic Flask Shaker (Electric)
3. Fruit Maturity Tester
4. Vacuum-cum-Pressure Tester
5. Hot Air Oven
6. Vacuum Oven
7. Muffle-Furnace
8. Water Distillation Unit
9. Thermostatic Water-Baths
10. Magnetic Stirrer-cum-Hot-Plate
11. Avery Semi-Self Indicating Balance
12. Gas Generator
13. Seesmotherm Multi-Heating Mantles for Kjeldahl
14. Tempo Multi-Heating Mantles for Soxhlet
15. Remi-Automix Blender

## **5. Pilot-Plant Equipments**

*(A) Freezing and Refrigeration Equipments*

1. Walk-in-Cooler
2. Krispcold Deep-Freezer (up to  $-20^{\circ}\text{F}$ )
3. Refrigerators

*(B) Fruit and Vegetable Technology*

1. MB Can Body Reformer
2. Flanger
3. Fruit Mill
4. Tomato Pulper
5. Pine Apple Slicer
6. Rosing Machine
7. Basket Press
8. Steam-jacketted Kettles
9. Exhaust Box



10. MB Can Seamer
  11. Crown Corking Machine
  12. Sterilization and Cooling Tanks
  13. Boiler
  14. Dehydrator (Cross-flow, 48 trays)
  15. Dehydrator (capacity 12 trays)
- (C) Cereal Technology Equipments*
1. Laboratory Mill (Flour Mill)
  2. Automatic Flour Kneading Machine
  3. Baking Oven for Bread, etc.
  4. Automatic Bread Slicing Machine
- (D) Special Equipments*
1. Miltone Plant
  2. Pest-Proofing Machine

## Schedule of Charges for Analytical Work

<i>Item No.</i>	<i>Details of analysis</i>	<i>Rate per each sample (Rs.)</i>
I.	<b>Bacteriological exam. of</b>	
	(i) Jam, Jelly or Marmalade	65
	(ii) Bottled fruit juice, squash, sherbat or any beverage	65
	(iii) Frozen food, dried food or nut or nut products	65
	(iv) Tomato products (Types of organisms)	65
	(v) Miscellaneous samples like milk, butter, cheese, ice-cream, canned fruit, vegetables, meat, drinking water or plants and equipments of the factories of any other food or allied products	65
	*(vi) Spices, condiments, flavouring, sugar or starch	60
	*(vii) Testing of detergent.	60
II.	<b>Estimation of</b>	
	(a) Moisture	10
	(b) Total ash	10
	(c) Acid insol. ash	15
	(d) Protein	20
	(e) Crude fibre	15
	(f) Starch	15



<i>Item No.</i>	<i>Details of analysis</i>	<i>Rate per each sample (Rs.)</i>
	(g) Non volatile ether extract	50
	(h) Volatile oil	50
	(i) Reducing sugars	15
	(j) Total sugars	15
	(k) Acidity	15
	(l) Sodium	50
	(m) Potassium	50
	(n) Calcium	15
	(o) Phosphorus	15
	(p) Iron	20
	(q) Copper	50
	(r) Sulphur	20
	(s) Lead	50
	(t) Zinc	50
	(u) Arsenic	50
	(v) Sodium chloride	15
	(w) Moisture, Total ash, fat, acid insoluble ash and protein in one sample.	50
<b>*III.</b>	<b>Estimation of</b>	
	(a) Iodine value	10
	(b) Saponification value	10
	(c) Free fatty acid	10
	(d) Identification coal tar colours	10
	(e) Preservatives (Benzoic acid or sulphur-di-oxide or sorbic acid)	30
	(f) Silica	5
	(g) Estimation of bulk density	5
	(h) Tintometer reading	15
	(i) Viscometer reading.	15
<b>IV.</b>	<b>Physico-chemical analysis of</b>	
	(1) Canned fruit or vegetables	65
	(2) Jams, Jellies or marmalades	65
	(3) Candied, crystallised products or preserves	65
	(4) Dried fruit or vegetables	65
	(5) Jam, squash, cordial, syrup	65
	(6) Chutney, sauce or pickle	65
	(7) Wine, vinegar on condiment	65
	(8) Ready to serve beverages	65
	(9) Honey	65



<i>Item No.</i>	<i>Details of analysis</i>	<i>Rate per each sample (Rs.)</i>
V.	<b>Water Analysis</b>	
	(a) Analysis for solid residue due to hardness (temporary and permanent)	60
	(b) Analysis for portability which will include the following tests :	
	1. Total dissolved solids	150
	2. Suspended matter	
	3. Nitrogen in organic or mineralised combinations )	
	4. Oxygen absorbed from acid permanganate )	
	5. Combined chlorine )	150
	6. Hardness )	
	7. Metallic contamination )	
	(c) 1. pH	5
	2. Alkalinity to phenolphthalein	5
	3. Alkalinity to Methyl orange	5
* VI.	<b>Estimation of Vitamins</b>	
	1. Vitamin A	60
	2. Nicotinic acid	60
	3. Riboflavin	60
	4. Vitamin B <sub>1</sub>	60
	5. Folic Acid	80
	6. Vitamin B <sub>12</sub>	80
	7. Vitamin C by direct titration	15
	8. Vitamin C by colorimetric titration	20
* VII.	<b>Estimation of Amino acids per each amino acid per sample or available lysine</b>	50
* VIII.	<b>Estimation of</b>	
	(i) Caffeine (in tea, coffee) or theobromine (in cocoa)	60
	(ii) Chlorogenic acid in coffee	60
	(iii) Tannins	15
	(iv) Water extract, color and density, microscope test, cup test and tannins in raw and roasted coffee, chicory mixtures, soluble coffee, soluble tea, cocoa and covering chocolates as per ISI specifications	100
	(v) Tea as per ISI specifications	100
* IX.	(i) Estimation of essential or one active principle in spices	60
	(ii) Estimation and physical characteristics of essential oil (Sp. gr. refractive index, optical rotation, solubility in alcohol)	100
	(iii) Oleoresin yield and analysis of main ingredient	100
	(iv) Residual solvent in Oleoresin by VPC method	200
	(B) Bulk distillation of spices for essential oil. Every 25 kg (or less) or raw material supplied	100
	(C) Bulk preparation of oleoresin per kg (raw material and solvents to be supplied by party)	50
* X.	<b>Alcoholic beverages</b>	
	(a) Rum as per ISI specifications IS 3752/67 Ref: 3, 9, 11, 12, 14, 16	140
	(b) Beer as per ISI specifications IS 3865/66 A, B and C IS 3752/66 15	100
	(c) Brandies as per ISI specifications IS 3752/67-3,6,7,11,12,13,14,16	155
	(d) Whisky, as per ISI specifications, IS 3752/67-3,6,7,11,12,13,14,16	155
	(e) Gin as per ISI specifications, IS 3752/67-3,6,11,12,13 and 16	150



<i>Item No.</i>	<i>Details of analysis</i>	<i>Rate per each sample (Rs.)</i>
* XI.	<b>Aflatoxin</b>	75
* XII.	<b>Pesticides</b>	
	(a) Active ingredient in formulation	50
	(b) Pesticide residue in cereals, pulses, fruits and vegetables	75
	(c) Pesticide residue in fats, oils, milk and animal products	150
	(d) Residue analysis tea, coffee, spices	100
* XIII.	<b>Food colours as per ISI specifications</b>	
	(a) Total dye content	15
	(b) Volatile matter	35
	(c) Water insoluble matter	10
	(d) Ether extractable matter	30
	(e) Inorganic iodide	15
	(f) Lead	50
	(g) Arsenic	50
	(h) for all constituents 'a to g'	200
* XIV.	Weaning food as per ISI specifications IS 1656-1969 for 17 components e.g. (1) Moisture (2) Total protein (3) Fat (4) Total carbohydrates (5) Total ash (6) Ash insoluble in acid (7) Crude fibre (8) Vitamin A (9) Vitamin C (10) Vitamin D (11) Thiamine (12) Riboflavin (13) Nicotinic acid (14) Calcium (15) Iron (16) Bacterial count (17) Coliform count	500
* XV.	1. Protein efficiency ratio per sample	500
	2. Nett protein utilisation per sample	500
	3. Digestibility per sample	250
	4. Biological value per sample	1000
* XVI.	<b>Barley and malt</b>	
	1. Barley ISI requirements	75
	2. Malt extract	60
	3. Malt	150
* XVII.	<b>Wheat flour</b>	
	1. Gluten wet and dry	25
	2. Diastatic	25
	3. Farinograph data	50
* XVIII.	<b>Rice</b>	
	1. Paddy milling quality (Brown rice, milled rice, head rice yield, dockage testing)	10
	2. Rice degree of milling	10
* XIX.	Supply of typed copies of scientific articles, abstracts etc. per foolscap sheet, double space typing	75 paise
	* Facilities for these items are available in the main Institute at Mysore.	

**Note :** All rates are subject to revision please.

**For further information please contact :**

Project Coordinator Incharge  
CFTRI Experiment Station  
Gill Road, LUDHIANA-6  
Phones : Office 24568 Res 22058  
Grams : FOODSEARCH LUDHIANA



SISI

Small Industries Service Institute

Industrial Area B

LUDHIANA-141003

Tel : 24733-34

Grams: SMALLIND



*(a) Facilities available in the Chemical Laboratory*

1. Analysis of ferrous & non-ferrous metals.
2. Analysis of Electroplating salts & solutions.
3. Analysis of laundry soaps.
4. Analysis of Chemicals for percentage purity, moisture content, melting point etc.
5. Analysis of water for Industrial purposes.
6. Analysis of Oil Cakes & Oil Seeds for Oil Content.
7. Analysis of stationery items.
8. Analysis of oil for fatty matter, alkalinity, saponification etc.

*(b) Facilities available in the Metallurgical Laboratory*

**1. Moulding Sand Tests**

- (i) Green Compression strength
- (ii) Permeability No.
- (iii) Gradation & A. F. S. No.
- (iv) Clay contents
- (v) Moisture Contents
- (vi) Hardness of sand moulds and cores
- (vii) Shape of Sand Grains

**2. Hardness Tests**

- (i) Rockwell
- (ii) Poldi Hammer

**3. Cupping Test to know the malleability of sheets**

**4. Sodium Cyanide Percentage of Hardening Salts**

**5. Measurement of Temperature of Molten Salt bath, Molten Non-ferrous and ferrous metals, and gases**

**6. Measurement of Case-depth**

**7. Determination of**

- (i) Flow lines
- (ii) Flows and discontinuities
- (iii) Sulphur Segregation

**8. Rapid Silicon Determination of Cast Iron**

**9. Pressure and Volume determination of air flow through cylindrical ducts**

**10. Proposed Facilities**

Stress Relief of castings and welded structures through Formula-62.



SISI

Small Industries Service Institute

Janak Kuti

Chambaghat

Solan (H. P.)

Tel : 265, 705 (Solan)

Gram : SMALLIND SOLAN



With a view of providing necessary assistance for speedy development of small scale industries in Himachal Pradesh, the Govt. of India set up a Branch Institute at Solan in June 1973 under the charge of a Deputy Director. Before that period, it was a unique Extension Training Centre in the country providing training in glass blown scientific apparatus and thermometers manufacturing. To expand the activities of this Institute for the benefit of prospective entrepreneurs, existing industrialists and to render technical, managerial and economic assistance more effectively this Institute was strengthened with the posting of a Director and other officers in different trades from September 1975. This Institute now is independent and exclusively for the State of Himachal Pradesh

The following types of assistance are rendered by this Institute :

- ☐ We supply economic information to help entrepreneurs in selecting proper lines of manufacture.
- ☐ We assist entrepreneurs in preparation of schemes, designs, layouts, etc. for setting up new industries and expansion of existing ones.
- ☐ We render technical assistance in the proper selection, installation and operation of plant & machinery.
- ☐ We assist in introducing improved methods of production for better quality and higher productivity.
- ☐ We assist in modernisation of existing small scale industries by eradicating out moded technology, obsolete machinery and equipment, in a selective, phased planned and integrated manner by providing various inputs required for the purpose.
- ☐ We assist the existing small scale units in assessing their production capacity along with the representative of State Directorate of Industries for their requirement of imported and indigenous scarce raw material.
- ☐ We organise exhibitions, seminars, open house discussions, intensive campaigns, etc. for development of small scale industries.
- ☐ We provide technical training in glass blown scientific apparatus, thermo-



meters (clinical and industrial), decoration of glass articles, potteries and silk printing under courses of different durations.

- ☐ We actively participate in training educated unemployed engineers and graduates in the Industrial Entrepreneurship course organised by the State Industries Department.
- ☐ We offer common facility service for filling of thermometers for small scale industrial units.
- ☐ We offer management consultancy services.
- ☐ We conduct inplant studies in existing small scale units and give recommendations for their all round improvement.
- ☐ We render guidance and assistance to small scale units for promotions of exports.
- ☐ We assist in developing small scale ancillary units for production of stores required by large scale units. We do liaison work by linking existing small scale manufacturers for products required by large scale units.
- ☐ We have a reference library containing technical books and periodicals which is open to industrialists.
- ☐ We assist in getting financial assistance from Nationalised Banks including State Bank of India and its subsidiaries, State Financial Corporation, etc.
- ☐ We assist in getting plant and machinery on hire purchase basis and in marketing the products to various Government agencies through National Small Industries Corporation of India.

*Write to :*

Small Industries Service Institute  
Chambaghat, Solan (H. P.)







GEC

Guru Nanak Engineering College  
LUDHIANA

## INTRODUCTION

Guru Nanak Engineering College was established in 1953. The Institution started with Diploma courses in a small way, but had vision of a big College which materialised in 1956, when it started degree courses in Civil, Mechanical and Elect. Engg. also. Total investment today stands at about two crores of rupees in buildings and equipment. The Institution is equipped to develop health and education in an atmosphere away from the congestion of the Ludhiana town. This educational Institution is fulfilling the primary need of the State in the field of technical education, and has well equipped laboratory facilities to undertake the testing of materials and products of industries and provide consultancy service.

Research & Development facilities available in various departments are as under :

## CIVIL ENGINEERING DEPARTMENT

The Department can provide facilities of Design and Testing as under :

Design of structures of concrete, Steel, masonry & timber including foundations, such as design of multistoreyed buildings, folded plates, water reservoir including staging, retaining walls etc.

Design of machine foundations.

Architectural and structural design of residential and other buildings.

Testing of building materials such as bricks, cement, sand, aggregate, concrete, etc.

Testing of metals in tension, compression, hardness, torsion, impact, fatigue, etc.

Testing of metals in tension, compression, hardness, torsion, impact, fatigue, etc.

Testing of soil samples for various Engg. properties & determination of bearing capacity, C. B. R. value, etc.

Conducting soil and survey.

Testing of road aggregate & bituminous materials.

Repair & adjustment of surveying instruments like levels, theodolites, etc.

## ELECTRICAL ENGINEERING DEPARTMENT

The Electrical Engineering Department have the following well equipped Laboratories :

1. Electrical Machines Laboratory
2. Electrical Measurements Laboratory
3. Electronics Laboratory
4. H. V. Laboratory

Testing of motors, generators and transformers of moderate capacity can be undertaken in the Electrical Machines Lab.



The Electrical Measurements Lab. is equipped with the apparatus required for testing of A. C. & D. C. meters, calibration, different types of meters including single phase and three phase energy meters. Facilities also exist for measurement of low and high resistances.

The H. V. Lab. is equipped with a 550 KV impulse generator and a 150 KV transformer.

Insulation breakdown tests can be performed on insulators, transformer oil etc.

Expertise from competent and qualified staff is available in the following fields :

1. Power systems
2. Instrumentation and modelling and identification of biological systems
3. Design of transformers, chokes, fractional horse power motors, Battery charges and battery eliminators etc.
4. Control systems

## **MECHANICAL ENGINEERING DEPARTMENT**

The following facilities exist :

1. Development of B. B. Cup by Cold Rolling Process. Production Engineering
2. Bearing Design and Machine Tools
3. Machine Design and Vibrations
4. Hydraulic Machine Design. Machine erection. Design of Hydraulic Systems
5. Performance and endurance tests on diesel engines as per I. S. 1600 and I. S. 1601.
6. For checking the performance and knowing the different characteristic curves of reciprocating compressors.

## **DEPARTMENT OF AUTOMOBILE AND TRACTOR ENGINEERING**

The following facilities are available :

### **Engine Analyser Instruments**

1. R. P. M. cam angle tester
2. Ignition coil and condenser tester
3. Plug scope to check condition of spark on running engine
4. Timing lights—to check ignition timing
5. Compression gauge
  - (i) Petrol engine
  - (ii) Diesel engine

### **Diesel Engine equipment**

6. Fuel injection pump test bench
7. Injector tester
8. P. S. G. Hydraulic Dynamometer for (25 H. P. to 100 H. P.) Type H. D. non-reversible type to find engine horse power
9. Wheel alignment gauge to check toe in, toe out, camber, castor and king pin inclination

10. Engineers' Stethoscope
11. Valve refacing machine (U.S.A.)
12. Valve seat cutting equipment
13. Spark plug cleaner and tester.

## **COLLEGE WORKSHOP**

The following facilities can be offered :

1. Use of long range thread milling machine to cut the lead screws, square thread, Multi start threads etc.
2. Vertical Milling Machine with rotary table for groove cutting in discs and manufacture of cams.
3. Gear Cutting facility on the Universal milling machine
4. Grinding of Tools & Cutters
5. Any other fabrication work within the available resources in various shops.

## **DEPARTMENT OF APPLIED PHYSICS**

Applied Physics Laboratory has the following facilities for the measurement of some properties of materials :

1. Elastic properties of wires, rods
2. Viscosity, surface tension, specific heat and thermal conductivity of liquids
3. Thermal conductivity and thermal expansion of solids
4. Refractive index of transparent materials
5. Electrical resistivity of metals
6. Thermo-electric effect
7. Optical-activity of materials
8. Measurement of capacity of condensers
9. Measurement of Inductance of coil (self and mutual).

## **DEPARTMENT OF CHEMISTRY**

The following facilities exist in the Chemistry Laboratory :

1. Viscosity of oils (Red Wood No. I and II)
2. Flash Point of oils
3. Cloud and pour point of lubricating oils
4. Testing of cement
5. Cement sand ratio in set cement concrete
6. Analysis of iron and steel (excepting carbon content)
7. Calorific value of solid and liquid fuels
8. Carbon residue test
9. Orsat Analysis of flue gases.



**TIET**

**Thaper Institute of Engineering & Technology  
PATIALA**

## INTRODUCTION

In 1956, by an agreement between the Mohini Thapar Charitable Trust (MTCT) and the then PEPSU Government, a Trust called the PATIALA TECHNICAL EDUCATION TRUST (PTET) was constituted. Its envisaged aim was to provide better facilities for the citizens of the region by establishing in Patiala an Institute of Engineering & Technology for imparting technical education up to Graduate and Post-graduate courses in Civil, Electrical, Mechanical, Architectural and Automobile Engineering, Textile Technology, courses for the overseers, Foremen, Tradesmen and such other courses in various branches of engineering and Technology as may be decided upon from time to time.

From the very inception of this Institute, Degree and diploma courses in Civil, Electrical and Mechanical Engineering have been running. In 1971-72, M. E. and Postgraduate diploma courses in Civil Engineering (Structures) were started on a full time as well as part-time basis. Last year, the Institute took some significant strides forward. Some of our teachers are getting registered for research for Ph. D. under the Doctoral Programme which was recently approved for this Institute by the Punjabi University.

This year, we started a part-time Post-graduate course leading to M. E. degree in *Electrical Machines & Power*. This course is designed to cater to the long-felt need of field engineers for keeping pace with the modern developments in the area of power and energy utilisation. Also, a diversified B. E. degree course in *Electronics & Electrical Communication* has been started from 2nd January, 1978. Proposals for starting a whole time Post-graduate course in Electrical Engineering and a diversified course in *Instrumentation & Process Control* leading to M. E. and B. E. degrees have been submitted to the Government of India through the State Government.

In the Mechanical Engineering Department, part-time M. E. course in *Heat Power Engineering* was started this year. The department developed a new laboratory of *Machine Tool Engineering and Metrology* and also acquired one LT-20 HMT lathe. A new diversification in the department leading to B. E. degree in *Industrial Design* has been recommended by the State Government to the Central Government. A laboratory in Foundry Technology is being set up.

Our Polytechnic has added equipment worth Rs. 1.94 lakh under "Modernisation of Equipment Grant" received from the Punjab Government and the Patiala Technical Education Trust. This has enabled the Polytechnic to fully furnish a newly set up *Electronics Laboratory* and Civil, Electrical and Mechanical Project Shops.

A major academic change that was started this year is the introduction of Credit System. This system is expected to bring in flexibility of course-wise promotion and selection of courses to enable the students to take up courses as well as load according to their interests and capacity. This will reduce the burden and wastage of compartment examinations. Also under way is a thorough reorientation of the courses in keeping with the Credit System.

The Institute has established a reasonably good contact with industry and Government departments. It provides consultation on matters pertaining



to Research, Design & Development and Testing of products and testing of materials and processes. It has well equipped laboratories and workshops and has been undertaking testing of materials, etc. sent by Government departments like P. W. D., M. E. S., P. S. E. B., Municipalities and small & medium scale industries. The institute is represented on the State level R D & D Committee for small scale industries.

## FACILITIES AVAILABLE IN ELECTRICAL ENGINEERING DEPARTMENT

The Department of Electrical Engineering has the following laboratories :

- i Electrical Machines Laboratory
- ii Electrical Measurement Laboratory
- iii High Voltage Laboratory
- iv Electrical Communications and Electronics Laboratory
- v Electrical Control Systems Laboratory

### Equipment

The department is equipped and is in the stage of being equipped with modern sophisticated equipment. To mention a few items, we have :

- i A 440 V/150 KV, 48 KVA high voltage transformer
- ii A portable oil testing set
- iii A variety of electrical machines
- iv Analog Computer
- v Digicom
- vi Servoscope
- vii Transfer function analyser
- viii Digital instruments
- ix X-Y plotter
- x Function generators.

### Testing and Repair Facilities

The department at present can extend testing facilities for testing of :

- (i) electrical machines; (ii) power apparatus; (iii) electrical instruments; (iv) medical instruments; (v) relays; (vi) insulating materials and transformer oil; (vii) current and potential transformers; (viii) household appliances; (ix) automobile electrical equipment; (x) tubes and transistors; (xi) electronic circuits; (xii) instrumentation systems.

### Design and Fabrication

Expertise and facilities are available in the department for designing and fabricating the following :

- i Fractional horse power induction motors

- ii Fractional horse power d. c. and universal motors
- iii Electric fans
- iv Power and radio frequency transformers
- v Chokes
- vi Welding transformers
- vii Selsyns and servos
- viii Servo-motors
- ix Motor controllers using SOR devices
- x Control equipment for power and electronic appliances
- xi Battery Charges
- xii Automatic voltage stabilisers
- xiii Timers and counters
- xiv Desk calculator
- xv Sweep generator using integrated circuits.

## Research Facilities

Research facilities exist in the department in the following fields :

- i Corona discharges
- ii Optimization techniques as applied to power systems
- iii Application of SCR devices to machines and power applications
- iv Excitation systems
- v System Theory applications to computer and biological systems
- vi Micro-electronics
- vii Pseudo-random generators
- viii Pre-amplifiers
- xi Dielectrics.

## Feasibility Studies

The department has facilities available to conduct feasibility studies on actual industrial projects manufacturing electrical and electronic equipment.

## DEPARTMENT OF MECHANICAL ENGINEERING

### Facilities Available

#### Material Testing

- i Testing of metals under tension, compression on Universal Testing Machine capacity 50,000 kg (50 Tonne).



- ii Testing of strips, wires on tensile Testing Machine capacity 8000 lbs.
  - iii Surface hardness Testing on Rockwell B & C scales, Brinell & Vickers Tests.
  - iv Torsion testing of metals Max. capacity 60,000 cm-kgr.
  - v Impact Testing for the following tests :
    - a. Charpy; b. Izod; c. Tension
  - vi Fatigue testing of metals under bending.
- In addition to the above Photoelastic bench is available for studying the stress analysis.

#### **Automobile & I. C. Engines**

- i Compression Tester for Petrol Engine.
- ii Compression Tester for Diesel Engine 'Suko' (German).
- iii Vacuum and Fuel Pump Tester U. S. A. 0-30.
- iv Toe-in Toe-out gauge (Telescopic Type India).
- v Cylinder Honing outfit complete with driving unit control and stones ancs. U. S. A.  $2\frac{1}{2}$ " -  $4\frac{1}{8}$ " in Metal Box 500 models.
- vi Fuel injection Testing Machine 400 psi German Bosch No. 8681143013.
- vii Cylinder Bore gauge.
- viii Nozzle cleaning kit complete German.

#### **Refrigeration & Air Conditioning**

Gas charging panel with vacuum pump.

### **DEPARTMENT OF APPLIED PHYSICS**

- The Applied Physics Lab. Is very well equipped for measurement of certain properties of materials. Measurements can be made on :
  - Elastic constant of wires.
  - Surface tension and viscosity of liquids.
  - Thermal conductivities of metals and insulators.
  - Specific heats of solids and liquids.
  - Thermal expansion of solids and liquids.
  - Refractive indices of transparent objects.
  - Electrical resistivity of metals and its variation with temperature.
  - Thermoelectric effects.
  - Hysteresis loss in ferromagnetic materials.

Equipment is being procured for the study of photoelectric effect and thermionic emission and for measurement of :

- i Hall coefficient, resistivity and energy gap of semiconductors.
- ii Susceptibility of paramagnetic materials.

## **DEPARTMENT OF APPLIED CHEMISTRY**

### **Facilities Available**

Water testing.

Lubricants testing.

Chemical analysis of metals.

Coal testing.

## **CIVIL ENGINEERING DEPARTMENT (FOR TESTING PURPOSES)**

### **Soil Tests**

1. Classification tests
2. Lab and Field Permeability Test
3. Shear Tests
4. Geophysical exploration including Penetration tests
5. Bearing capacity loading tests
6. Compaction and C. B. R. test
7. Chemical Analysis of Soils

### **Cement & Aggregate Testing**

#### **(a) Cement Testing**

1. Chemical Analysis of Cement
2. Cement content of set mortar & concrete
3. Cement test as per I. S. 269

Fineness, soundness, setting time

Consistency, compressive & tensile tests on cement sand mortar.

#### **(b) Aggregate Testing**

1. Fineness Modulus & suitability for R. C. C. work
2. Design of Mixes for use in structures
3. Concrete testing

Crushing strength & compression strength for cubes & cylinders  
Modulus of Rupture test on beams.



**(c) Bricks**

Crushing strength; Absorption Coefficient

**(d) Lime**

Suitability for white washing, mortars, etc.

## Highway Material Testing

Physical and Chemical tests for aggregates and binders.

1. Grading of the aggregates hardness, soundness, Attrition, Absorption & abrasion value. Aggregate impact value.
2. Flash pt., fire pt., ductility, specific gravity, softening point, viscosity, stripping test, Freezing & Shaving
3. C. B. R. Test.

## ENVIRONMENTAL ENGINEERING LABORATORY

Testing of water and waste water.

Analysis of industrial effluents for B. O. D., C. O. D. and chemical composition.

Testing of set mortar and concrete

Cement content of set cement/lime mortar & concrete

Consultancy services to industries for the economic disposal of waste effluents.

## Design and Consultancy

1. Project Feasibility Studies
2. Design of Foundations
3. (i) Planning & Design of buildings, bridges, water supply system including water tanks, overhead reservoirs.  
Analysis & Design of Civil Engineering structures for seismic loads.  
(ii) Design of hydraulic structures and canals.
4. Architectural consultation.  
Architectural Design of Buildings, Public Utility Buildings, bridges.
5. Preparing & checking of estimates and specifications.
6. Consultation for building services.
7. Surveying.
8. Servicing of Survey Instruments.
9. Highway Geometric Design, Design of traffic signals, Road junctions etc.

*For details please contact:*

Principal  
Thapar Institute of Engineering & Design  
Patiala





**NML**  
(FIELD STATION)

National Metallurgical Field Station  
BATALA  
Grams : REGFDS

The National Metallurgical Laboratory Field Station at Batala is equipped with the facilities for Chemical Analysis of all the Ferrous, Non-Ferrous Metals and Foundry raw materials. Such facilities are also available at other field stations of NML.

There are at present more than 4000 foundries producing non-ferrous, iron, steel and malleable iron castings. Major number of these foundries are of small scale type which do not have adequate facilities for testing and improvement of their products. As a result they are often handicapped in producing quality castings to compete in the market. It is, therefore, imperative that the problems of the Small Scale Foundries should be looked into so that they can produce quality castings with the resources at their command. In this context the National Metallurgical Laboratory has so far set up four Foundry Stations at Batala, Madras, Howrah and Ahmedabad where these small scale foundries are concentrated and is also contemplating to establish another Station at Agra. These Foundry Stations have taken up an active programme to look into the difficulties of the Small Scale Foundries by way of periodical visits, advising on the spot regarding operational problems, testing their raw materials and suggesting methods of improvement for production of quality castings. The services of the NML Foundry Stations in this respect have already been acknowledged in certain quarters.

## Service Facilities at NML Foundry Stations

The NML Foundry Stations are equipped with adequate facilities for the testing of foundry sands and bonding clays used by the local foundries and also of nearby available deposits, so as to find out their suitability for specific casting purposes. Stations are also equipped to undertake chemical analysis of both ferrous and non-ferrous metals, moulding sands and other foundry raw materials. The National Metallurgical Laboratory Foundry Stations will expand the service facilities to include metallographic examination and mechanical testing as well as undertaking experimental work on problems relating to metal melting.

## Programme of Work at NML Foundry Stations

1. Periodical testing of foundry sands, bonding clays used in foundries and raw materials like pig iron, limestone, coke, etc., used for melting as well as finished products.
2. To tender technical advice regarding selection and application of indigenous foundry sands and other moulding materials, including selection of metal charges for the production of various types of castings.
3. To undertake ad-hoc investigations on the problems faced by individual foundries and to suggest suitable remedial measures thereof.
4. To conduct a survey of the moulding materials available in respective regions and to study their chemical and physical properties.
5. To conduct periodical refresher courses to the staff sponsored by the foundries.
6. Standardization of melting and moulding techniques in under-developed foundries.
7. To advise the operational staff on modern foundry technology and to issue technical bulletins periodically.



8. To carry out research and development work, standardization and simplification of moulding, melting and other technological procedures to achieve quality as well as productivity.

The National Metallurgical Laboratory Foundry Stations are at the service of the Small Scale Foundries. For any technical problem the nearby Field Officer of the Stations can be contacted for help and guidance. Following are the full addresses of the NML Foundry Stations where the enquiries are to be sent.

1. The Field Officer,  
NML Foundry Station,  
Industrial Estate,  
Guindy,  
Madras-32
2. The Field Officer,  
NML Foundry Station,  
Industrial Estate,  
Batala,  
Punjab
3. The Field Officer,  
NML Foundry Station,  
Industrial Estate,  
P. O. Baltikuri,  
Howrah
4. The Field Officer,  
NML Foundry Station,  
Industrial Estate,  
Naroda,  
Ahmedabad

In addition, the Small Scale Foundries can also refer their problems to :

The Director  
National Metallurgical Laboratory  
JAMSHEDPUR-7





PAU

Punjab Agricultural University  
LUDHIANA

The Punjab Agricultural University was established in 1962 with the object of increasing tempo of agricultural research to bring about greater agriculture production. The basic structure of the Organisation of the University has been patterned on the model of Land Grant University in the United States with a complete integration of residential teaching research and extension education in the agriculture, agricultural engineering, home sciences and veterinary sciences.

The main functions of PAU are to undertake teaching of courses in the Colleges to carry out research both applied and fundamental, and to carry out extension education for the dissemination of research findings among the farming community.

The various Departments of the University provide consultancy such as :

- (a) Agro Industrial Processing
- (b) Grain storage and handling including drying
- (c) Farm structures
- (d) Solid state applications in process controls and other applications of thyristors
- (e) Capacitor installations in industry
- (f) System Optimization.

The major facilities available in the Department of Processing and Agriculture Structures are given below and these can be utilised by the Small Scale Industry.

- |   |   |
|---|---|
| 1. Engineering Properties of Biological Materials | Testing of different kinds of biological materials can be done in order to ascertain the strength, thermal and other engineering properties.  |
| 2. Food Engineering Laboratory                    | Testing of edible oil engineering equipment and other food processing equipment can be done.  |
| 3. Unit operations in agricultural processing     | Cleaning, grading and drying of agricultural materials can be recommended based on the laboratory test.   |
| 4. Wind tunnel facilities                         | Aero dynamic studies of biological materials and farm building materials can be done so that proper air velocity for cleaning and design of farm buildings according to prevailing wind direction can be done.                            |
| 5. Storage Engineering Laboratory                 | All kinds of storage quality tests of cereals and edible oilseeds and oil bearing material can be done. Evaluation of grain storage structures is also done. Development and design of new storage structure and equipment is undertaken. |



- |    |                              |   |
|----|------------------------------|---|
| 6. | Low Temperature Storage Lab. | Storage characteristics of perishable materials and design and construction of cold storages are being taken. |
| 7. | Animal environment facility  | Studies on suitable environment for buffaloes and poultry are being studied for better production.            |

The necessary charges for conducting the test can be negotiated.





**NRDC**

**National Research Development Corporation of India  
61, Ring Road, Lajpat Nagar-III  
NEW DELHI-110024**

The National Research Development Corporation of India (NRDC) was established by the Government of India in December 1953 as a non-profit organization. NRDC is registered under Section 25 of the Companies Act, 1956. It is charged with the responsibility of promoting development and exploitation of indigenous inventions, processes and knowhow, from all sources in the country, with a view to achieve self-reliance. NRDC is interested in fostering the spirit of inventivity amongst the people, especially independent workers, artisans and technicians.

### **What does NRDC do ?**

- \* Licences knowhow on processes and patents developed in public sector laboratories under the Council of Scientific & Industrial Research, Indian Council of Agricultural Research, Indian Council of Medical Research, Defence Research & Development Organisation, Research, Design and Standards Organisation (Railways), Bhabha Atomic Research Centre, and institutions like the Indian Institute of Technology, Universities, etc.
- \* Licences knowhow assigned to it by public or private sector industry
- \* Licences patented inventions of private individuals
- \* Assists in patenting the inventions from public sector organisations
- \* Supports pilot plant and developmental work of national importance either independently or in collaboration with industry
- \* Grants financial assistance for patenting and development of technically feasible and commercially viable ideas and inventions of individual inventors
- \* Awards cash prizes and certificates for outstanding inventions
- \* Evaluates, by itself or by engaging consultants, to the work done by laboratories or by independent inventors and makes the reports available to entrepreneurs for setting up production units
- \* Arranges large-scale or plant trials, if considered necessary, for commercial utilisation of a process or invention
- \* Helps in commercial exploitation of indigenous knowhow in foreign countries
- \* Arranges import of knowhow available with counterpart agencies in other countries, if such a knowhow is not available indigenously.

### **How to obtain knowhow from NRDC ?**

Every quarter NRDC brings out a brochure called "NRDC Processes" listing the processes available for licensing. Short write-ups called Preliminary Technical Notes are printed on every process. The brochure and the printed technical notes are widely circulated. Periodical advertisements on latest NRDC processes available are published in leading newspapers and technical periodicals.

Entrepreneurs may select the processes they are interested in and write to NRDC for further details. They will be supplied with a project profile which would generally indicate market demand, description of the process, special features of the process, raw materials required, types of equipment needed and their availability, capital investment including working capital, cost of production, profitability, scale of development, guarantees available etc.



Further discussions with the scientists/inventors can be arranged, if necessary. After the entrepreneur conveys his satisfaction regarding the knowhow, he has to submit a proforma duly filled up, which enables NRDC to assess his capabilities for setting up a production unit using NRDC know-how. The terms and conditions for licensing are finalised with the firm, after negotiations.

### **What are the licensing terms ?**

Normally, a licensee has to pay a premium and a recurring royalty for taking knowhow from NRDC. The premium, which is a lumpsum amount, is payable at the time of signing the agreement. The royalty which is a percentage on net sales value of the product is payable for a specified period. This varies between 5 to 14 years. After this period no royalty is payable to NRDC. Normally, NRDC processes are given on non-exclusive basis.

After the entrepreneur conveys his acceptance of the terms and conditions, a formal offer is placed on him by NRDC. On his receipt of this offer, the entrepreneur should send a crossed draft drawn in favour of NRDC of India for the lumpsum payable. NRDC will then send the agreement to the party and as soon as the party returns the agreement duly executed, NRDC will request the laboratory/institute to release the process details to the party.

### **How is the knowhow transferred ?**

After the payment of premium and signing of licence agreement, NRDC asks the concerned laboratory/inventor to transfer the knowhow to the licensee, by releasing detailed data, drawings and other relevant information. A demonstration of the process is arranged. Facilities are provided for training men from the licensee at the laboratory concerned.

### **Can a firm participate in developmental work ?**

When developmental or pilot plant work is necessary, NRDC finances up to 50 percent of the expenditure. The other 50 percent has to be borne by the firm. After successful completion of development work, the money advanced by NRDC is to be paid back. The process is licensed to the firm on mutually agreed terms. In the event of the development work not being successful, the NRDC writes off its own share of the money spent. At the close of the project the assets like equipment etc. are sold off and the proceeds divided between the entrepreneur and the NRDC as per the agreement.

### **What additional assistance does NRDC provide after the knowhow is purchased ?**

NRDC provides the following additional assistance after the knowhow is sold :

- \* Arranges services of the inventors during implementation of the project. No special fee is charged for the purpose except TA & DA for the staff involved
- \* Arranges the help of the laboratory/institute for testing and analysis of raw materials and products for quality control in the initial stages
- \* Gives assistance in :
  - (i) procurement of scarce raw materials controlled by Government



- (ii) import of raw materials and equipment
- (iii) sale of the product to Government departments
- (iv) recommending loans from various financial institutions

### **Does NRDC give loans for starting an industry ?**

NRDC is NOT A BANK. NRDC itself does not give any loan for starting production units. However, it can assist in obtaining loans from nationalized banks and other financial institutions.

### **How does NRDC help independent inventors ?**

NRDC gives the following assistance to independent inventors :

- \* Grants financial assistance for patenting, in deserving cases
- \* Grants financial assistance for the development of technically feasible and commercially viable ideas and inventions to the extent of the estimated amount required for making a prototype or model
- \* Gives cash awards merit and certificates to afford recognition to inventors for development of outstanding inventions
- \* Renders technical advice that may be required by an inventor
- \* Helps inventors in the commercial exploitation of inventions.

### **How to apply to NRDC for assistance ?**

Inventors seeking assistance from the NRDC have to apply on a prescribed form giving the present status of their idea/invention, alongwith the necessary technical details and cost estimates etc. to help NRDC in assessing the quantum and type of assistance required.

### **How are the applications for assistance evaluated ?**

The applications are initially screened by NRDC. Cases which are found technically and economically promising are referred to outside experts for evaluation. Their recommendations are placed before an Evaluation Committee for final decision.

### **Does NRDC provide workshop/laboratory facilities ?**

NRDC does not have a workshop/laboratory of its own but outside facilities can be arranged for making models or conducting trials and experiments at suitable public or private sector workshops/laboratories, wherever necessary.

### **What type of technical assistance does NRDC provide ?**

NRDC provides free technical guidance to inventors in patenting, development and commercialization of inventions.

### **What patent assistance does NRDC provide ?**

For inventions/ideas approved by it, NRDC provides technical and financial assistance for patenting in India and wherever necessary, in foreign countries. NRDC has special arrangements with patent attorneys for this purpose.



## **How does NRDC help the independent inventor in commercialization of his invention ?**

NRDC offers all the facilities it has for commercial exploitation of inventions of independent inventors. For this purpose, the invention has to be assigned to NRDC for exploitation.

### **Publications of NRDC**

#### **“Invention Intelligence”**

Invention Intelligence, started in 1965, is a popular monthly periodical of NRDC. It publishes material with a special bearing on new inventions, products and processes with a view to keep the inventors, scientists, technologists, entrepreneurs and students abreast with the latest developments in various fields of science and technology. The journal has been acknowledged as a link between scientists and technologists on the one hand and industry on the other. The annual subscription is Rs 10/-.

#### **“Awishkar”**

Awishkar, started in May 1971, is the Hindi monthly magazine of NRDC. It is designed to serve the information needs of inventors, artisans, technicians, students and entrepreneurs. The annual subscription is Rs. 3/-.

### **Preliminary Technical Notes**

These Notes on processes/inventions released for commercial exploitation by NRDC are available free of charge on request. The Notes contain sufficient information to enable an entrepreneur to judge whether or not he should seriously consider to undertake manufacture of a particular item.

### **NRDC Process Lists**

Process lists classified into various disciplines, like chemical, mechanical, electrical and electronics are available free of charge on request.

*For details please contact :*

**The Managing Director**

**National Research Development Corporation of India**

**61, Ring Road, Lajpat Nagar-III**

**NEW DELHI-110024**





**GID - SC**

Govt. Industrial Development-cum-Service Centre (Engg.)  
AMRITSAR

Government Industrial Development-cum-Service Centre (Engineering), Amritsar was set up by the Punjab Government with an aim to provide to the industry the facilities in various fields at no profit basis. The various facilities being provided are as under :

### **1. Technical Advice**

- (i) The centre provides the technical advice for Plant layout to any industry.
- (ii) The centre provides technical advice on tool designing to the industry.

### **2. Workshop Operations**

In this direction the centre provides the following facilities :

- (i) Tool & Cutter Grinding.
- (ii) Surface Grinding & Cylindrical Grinding.
- (iii) Centreless Grinding.
- (iv) Precision Turning.
- (v) Sheet Pressing.
- (vi) Balancing of moving component.

### **3. Testing Facilities**

In this field the centre provides following facilities :

- (i) Testing of electrical motors, ceiling fans and such other electrical equipments which are produced by the industry according to ISI specifications.
- (ii) Testing of machine tools.
- (iii) Mechanical testing of metals viz tensile testing etc.

### **4. Heat Treatment of Metals**

Heat treatment of metals/components is undertaken with liquid carburising and pack carburising methods.

### **5. Electroplating of Metals**

The centre is fully equipped for providing electroplating of nickel, chromium and zinc etc. on components.

### **6. Chemical Testing Laboratory**

To provide testing facilities to the industry a fully equipped lab. has been set up which provides the following testing :

- (i) Sand Testing.
- (ii) Chemical analysis of metals.
- (iii) Rubber Testing.



## **7. Electronics Laboratory**

The centre is also equipped for testing of television, radio and transistor. It also undertakes development of electronics items.

## **8. Cut Glass**

This Centre was the first to introduce cut-glass trade in India where German technicians provided the technical know-how in the initial stages. Now this trade has come up in a big way in the local market and the Punjab State has procured an export order of 3000 cut-glasses from Norway.





**NID**

National Institute of Design  
Paldi

**AHMEDABAD-380007**

Tel : 79693-4-5

Grams : INSTITUTE

## DESIGN SERVICE FOR SMALL INDUSTRIES

The National Institute of Design was established in Ahmedabad in 1961 by the Government of India for imparting training, service and research in various fields of design, such as product design, furniture design, ceramic design, textile design and visual communication which includes photography, film and sound. The Institute conducts a five-year professional education programme in these subjects, at the end of which students receive the NID Diploma. The Institute also has an active professional practice programme through which it provides consultancy services to industry.

It is in the small-scale sector that the need for good design is most keenly felt today. Many small units cannot afford investments in full-time professional industrial designers, and it is here that the NID can be of assistance. It can take on specific design problems for solution as part of its professional practice programme. It can provide extension services through seminars, workshops, exhibitions of good design and exhibitions trained designers to fill openings which exist in the small-scale sector.

In order to know how best NID can assist manufacturers, particulars should be provided to the Institute of specific design problems. To illustrate forms of NID assistance, the following examples may be useful. In one State, we are working with furniture manufacturers on the improvement of joinery systems and the development of 'knocked-down' furniture reassembled at the point of sale, thus saving on transportation and packaging expenses. In another State, we have worked out technical improvements on the traditional looms used in spinning fine khadi. Elsewhere we have worked with manufacturers to redesign their machine tools and portable power tools to reduce costs and to improve operational efficiency. We have created symbols and logotypes as well as designed exhibitions for many enterprises.

Assistance from NID can also take the form of Design Workshop at which manufacturers are invited to meet NID designers who will present case histories of design problems from their own experience, illustrating how these problems were solved. Such Workshops also serve to create a consciousness of what good design is and what it can do. NID plans to organise such Workshops in collaboration with the Directors of Industry in state governments as well as with other business and industrial organisations.



ISI

Manak Bhavan, 9 Bahadur Shah Zafar Marg  
NEW DELHI-110002

Telephones : 266021 (10 lines)  
              270131 (10 lines)

Telegrams : Manaksanstha  
(Common to all Offices)

## INDIAN STANDARDS INSTITUTION

Indian Standards Institution (ISI) was set up in 1947 with the active support of industrial, scientific and technical organizations in the country.

The aims and objects of the Institution include preparation of standards relating to products, commodities, materials and processes and promotion of their general adoption at national and international levels; certification of industrial products; assistance in the production of quality goods; and circulation of information relating to standardization.

### Indian Standards

Indian Standards are the national standards of the country specifying requirements for the production of quality goods. They deal with raw materials and finished and semi-finished products covering a wide range of fields.

Indian Standards are formulated by a large number of technical committees appointed by the eleven Division Councils of the Institution dealing with agricultural and food products; chemicals; civil engineering; consumer products and medical instruments; electronics and telecommunication; electrotechnical; marine, cargo movement and packaging; mechanical engineering; petroleum, coal and related products; structural and metals; and textiles. On these committees are taken experts representing various interests, such as producers, consumers, technologists, and research and testing organizations, both in public and private sectors. These experts work in honorary capacity and evolve national standards through a consensus of opinion.

### Implementation of Indian Standards

Implementation of Indian Standards is innate in the consensus procedure followed in their preparation. Besides, different departments of Central and State Governments and many local bodies have taken policy decisions to adopt Indian Standards. Important industrial undertakings and purchase organizations both in public and private sectors have also adopted Indian Standards in their manufacturing and purchase programmes.

A number of advantages accrue from the implementation of standards, such as assuring quality, ensuring safety, minimizing wastage, reducing costs, cutting down unnecessary varieties, ensuring interchangeability and increasing productivity. Standards serve as a guide for production of goods and services; provide basis for trade transactions; help technologists judge quality and performance; and provide solutions to recurring problems of the designer and the builder.

### ISI Certification Marks Scheme

To bring the advantages of standardization within the reach of the common consumer, the Institution is operating a Certification Marks Scheme under the *Indian Standards Institution (Certification Marks) Act, 1952*. This enables ISI to grant licences to manufacturers producing goods in conformity with Indian Standards to apply ISI Mark on their products.

Every licence includes a scheme of testing and inspection which the licensee is required to follow strictly. During the operation of the licence, ISI



Inspectors carry out regular and surprise inspection of the manufacturers' works to make sure that the scheme is being properly adhered to. Samples of certified products are drawn from the production line as well as from the open market and tested in independent laboratories. As a further safeguard for the consumer, the scheme provides for free replacement of ISI-marked goods found to be of substandard quality. Besides providing a third-party assurance of quality to the consumers, quality control operation helps the manufacturer in producing goods of quality, increasing productivity and achieving production economies in diverse ways.

### **Training Programmes**

The Institution assists Indian industries in promoting and developing organized in-plant standardization through training and survey programmes, conferences and factory visits. 'Extension Services' are also offered for promoting standardization at company and industry levels.

Under its International Training Programme, the Institution provides facilities for training standards engineers from developing countries of Asia, Africa and Latin America in principles, procedures, methodology and organization of standardization.

Programmes for educational utilization of standards are organized to acquaint technical teachers with the work of ISI with the object of introducing the subject of standardization in technical education. Training is also imparted in testing of products and statistical quality control, primarily to the technical personnel of industrial units holding licences to use ISI Mark on their products.

### **ISI Laboratories**

The Institution has laboratories at the Headquarters and nearby Ghaziabad for testing certified products manufactured in accordance with Indian Standard specifications as also those offered by applicants for the grant of licences under the ISI Certification Marks Scheme. Laboratories on a smaller scale have also been established at the Regional Offices at Bombay, Calcutta and Madras.

### **Standards-Consciousness**

The Institution takes a number of steps to ensure widespread implementation of Indian Standards, publicize the ISI Certification Marks Scheme and create standards-consciousness among different sectors of economy. Besides Indian Standards Conventions held periodically at important centres in the country, industry-wise conferences and seminars are organized on specific subjects with the object of discussing problems affecting these industries in relation to standardization and quality control. In addition, different public relations and publicity media are availed of for propagating the importance of standardization among the various sectors of economy.

### **Subscribing Members**

All organizations and individuals wishing to avail themselves of the specialized services offered by the Institution in the field of standardization and quality control can join the Institution as subscribing members in any of the different categories, namely, Patrons, Donors, Sustaining Members, Associate Members, Ordinary Members and Individual Members.



Depending upon the class of membership, the subscribing members enjoy a number of privileges, such as receipt, free of charge, of one copy each of ISI publications of interest to them; purchase of ISI publications at a discount; access to technical library on the Institution; facility of obtaining information on standardization in India and abroad; and the privilege to propose new subjects for standardization.

### **International Collaboration**

Besides preparing and promoting the use of national standards, the Institution furthers India's interest in the field of international standardization through close collaboration with the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). ISI is represented on important administrative and technical bodies of these organizations. Secretariats of some international technical committees, sub-committees and working groups dealing with subjects of importance to India are held by ISI. The Institution also actively participates in the work of the Asian Standards Advisory Committee (ASAC).

### **Regional and Branch Offices**

To keep close liaison with and render efficient service to industry, trade and commerce in different regions of the country, the Institution has opened its Regional/Branch Offices in Ahmedabad, Bangalore, Bhopal, Bhubaneswar, Bombay, Calcutta, Chandigarh, Hyderabad, Jaipur, Kanpur, Madras, Patna and Trivandrum.

#### *Regional Offices*

#### *Telephone*

Western : 3rd Floor, Novelty Chambers,  
Grant Road,  
BOMBAY 400007

37 97 29

Eastern : 5 Chowringhee Approach,  
P. O. Princep Street,  
CALCUTTA 700072

23 08 02

Southern: C. I. T. Campus, Adyar,  
MADRAS 600020

41 24 42

#### *Branch Offices*

'Pushpak' (3rd Floor), Nurmohamed  
Shaikh Marg, Khanpur,  
AHMEDABAD 380001

2 03 91

'F' Block, Unity Building, Narasimharaja Square,  
BANGALORE 560002

2 76 49

Gangotri Complex, Bhadbhada Road, T.T. Nagar,  
BHOPAL 462003

6 27 16



22 E Kalpana Area, BHUBANESHWAR 751014	5 36 27
Ahimsa Building (1st Floor), SCO 82-83, Sector 17C, CHANDIGARH 160017	2 83 20
5-8-56/57 L. N. Gupta Marg, HYDERABAD 500001	22 10 83
D-277 Todarmal Marg, Bani Park, JAIPUR 302006	6 98 32
117/418 B Sarvodaya Nagar, KANPUR 208005	8 12 72
B. C. I. Building (3rd Floor), Gandhi Maidan East, PATNA 800004	5 36 55
Hantex Building (2nd Floor), Railway Station Road, TRIVANDRUM 695001	32 27





**ETDC**

**Electronics Testing & Development Centre**  
**182/18, Industrial Area**  
**Chandigarh-160002**  
**Telephone : 23351**

## ETDC CHANDIGARH STAND FOR QUALITY AND RELIABILITY

- 1.1 Electronics Testing & Development Centre (ETDC) administered by Union Territory of Chandigarh through its Industrial Development Corporation has been set up for the promotion and systematic growth of electronics industries at Chandigarh. This Centre has been established as per the scheme of Standardisation, Testing & Quality Control, under Department of Electronics, Govt. of India and started functioning in mid-1975.
- 1.2 Chandigarh has achieved significant progress in the futuristic and fast growing field of electronics. With setting up of a number of electronics industries in and around this City beautiful, Chandigarh is fast developing into the new electronics hub of the country. The products presently under manufacture are Digital Test & Measuring Instruments, Medical Instrumentation, Analytical Equipments, Process Control Items & Timers, Temperature Controllers, Projection Microscopes, Display Units, etc.
- 1.3 Electronics is the nerve centre of modern technology and has pervaded practically all aspects of human activity. It is the heart of most of the modern weapon system, as also of business data systems, automated process control systems and communication systems which are essential for modern civilisation. These sophisticated systems being extremely complex, the chances of their malfunctioning are greater and the consequences costly. Thus it is essential to ensure reliability of the product by monitoring it at every stage of development and production.

### 1.4 Electronics Instrumentation Estate

The Chandigarh Administration has ventured into this sophisticated technology in keeping with its prestigious status of the City Beautiful. Chandigarh has the unique distinction of being a city planned ab-initio. On the same lines, the Chandigarh Electronics Instrumentation Estate has also the distinguishing feature of having new industries planned ab-initio on the campus where appropriate and matching facilities have been provided in the Testing & Development Centre, a wing of the Chandigarh Small Industries Development Corporation (Ltd), a Chandigarh Administration undertaking.

### 2.1 Electronics T & D Centre

The Centre is nucleus of the Instrumentation Estate where provision has been made for the building of ETDC and to accommodate 34 small and medium scale electronics and allied units. About half this number is already in the process of establishment. Built-up sheds are now being provided for the entrepreneurs to start the industry without involving huge investment of time and money.

### 2.2 The following wide range services are being provided at ETDC.

1. Testing of products as per ISI/manufacturer's specifications.
2. Testing of electronics components on sampling basis.
3. Testing of domestic electrical appliances and equipments.
4. Reliability testing of products.



5. Calibration of industrial grade instruments with traceability to NPL standards.
6. Test Analysis and guidance for product improvement.
7. Disseminations of Technical, Managerial and Industrial information.
8. Tool room facilities.
9. Supporting services viz. Sheet Metal Fabrication, PCB making, Coil winding, Panel engraving, drafting etc.
10. Technical reference library.
11. Repair and maintenance of industrial grade instruments.

**2.3** Apart from manufacturers, test facilities are extended to consumers or dealers in electronics/electrical products. Evaluation of the item can be carried out as per International or Indian Standards or as per manufacturer's specifications.

### 3.1 Calibration and Measurement Facilities

Parameter and Measurement Range	Frequency	Accuracy	Standard Source/ Measuring Instrument
<b>Voltage</b>			
1 $\mu$ V to 1000 Volts	DC	$\pm 0.0015\%$	DC Standard (Philips)
1 $\mu$ V to 1000 Volts	DC	$\pm 0.004\%$	Autorange DMM (HP)
10 $\mu$ V to 1000 Volts	DC	$\pm 0.005\%$ $\pm 0.002\%$	Digital Multimeter (Solartron)
1 $\mu$ V to 500 Volts	50 Hz to 10 KHz	$\pm 1.0\%$	AC Calibrator (Jullie)
1 $\mu$ V to 1000 Volts	50 Hz to 1000 KHz	$\pm 0.09\%$	Autorange DMM (HP)
10 $\mu$ V to 750 Volts	40 Hz to 10 KHz	$\pm 0.1\%$	DMM (Solartron)
<b>Current</b>			
1 nA to 120 mA	DC	$\pm 0.005\%$	Programmable Standard Source (Philips)
1 nA to 1.1 mA	DC	$\pm 0.005\%$	DMM (Solartron)
10 nA to 2000 mA	DC	$\pm 0.07\%$	DMM (HP)
$10^{-14}$ A to $10^{-3}$ A	DC	$\pm 0.5\%$	Pico-ammeter (ECIL)
1 $\mu$ A to 10 Amps	DC	$\pm 0.75\%$	DMM (Weston)
1 $\mu$ A to 10 Amps	50 Hz to 10 KHz	$\pm 1.0\%$	AC Calibrator (Jullie)
10 nA to 2000 mA	40 Hz to 20 KHz	$\pm 0.25\%$	Digital Multimeter (HP)
1 $\mu$ A to 10 Amps	40 Hz to 400 Hz	$\pm 1.5\%$	DMM Weston
<b>Resistance</b>			
100 $\mu$ ohm to 1 Terra ohm	$W=10^4$	$\pm 0.01\%$	Auto-balance bridge (Wayne Kerr)
3 mohm to 110 mohm	1 KHz	$\pm 0.1\%$	Universal Bridge (Marconi)

Parameter and Measurement Range	Frequency	Accuracy	Standard Source/Measuring Instrument
100 mohm to 11 mohm	DC	$\pm 0.05\%$	DMM (Schlumberger)
10 mohm to 20 mohm	DC	$\pm 0.02\%$	DMM (HP)
1 mohm to $10^7$ mohm	DC	$\pm 2\%$	Megaohmmeter (OSAW)
<b>Capacitance</b>			
0.001 PF to 1 Farad	$W=10^4$	$\pm 0.09\%$	Autobalance bridge (Wayne Kerr)
0.1 PF to 110 MFD	1 KHz	$\pm 0.1\%$	Universal Bridge (Marconi)
0.1 PF to 1999.9 MFD	1 KHz	$\pm 0.1\%$	Digital C-meter (ECD)
0.2 MFD to 22000 MFD	DC	$\pm 1\%$	Electrolytic C meter (BPL)
<b>Inductance</b>			
10 $\mu$ H to 110 MH	$W=10^4$	$\pm 0.01\%$	Auto balance Bridge (Wayne Kerr)
0.1 $\mu$ H to 100.9 H	1 KHz	$\pm 0.25\%$	Impedance Bridge (ESI)
0.1 $\mu$ H to 110 H	1 KHz	$\pm 0.1\%$	Universal Bridge (Marconi)
<b>Quality Factor (Q)</b>			
5 to 1000	1 KHz to 300 MHz	$\pm 5\%$	Circuit Magnification Meter (Marconi)
$10^{-2}$ to 1000	1 KHz	$\pm 0.5\%$	Impedance Bridge (ESI)
<b>Conductance</b>			
1999 nmho to 1999 m-mho	1 KHz	$\pm 0.25\%$	Impedance Bridge (ESI)
10 nmho to 100 m-mho	$W=10^4$	$\pm 0.01\%$	Auto-balance Bridge (Wayne Kerr)
<b>P Dissipation Factor</b>			
0.001 to 3	1 KHz	$\pm 10\%$	Universal Bridge (Marconi)
$10^{-3}$ to $10^2$	1 KHz	$\pm 0.5\%$	Impedance Bridge (ESI)
<b>Power</b>			
100 $\mu$ W to 10 W	40 Hz to 10 KHz	$\pm 0.3$ dB	Audio Power Meter (Beltronics)
up to 100 W	DC to 20 KHz	$\pm 10\%$	Wattmeter (Simpson)



Parameter and Measurement Range	Frequency	Accuracy	Standard Source/ Measuring Instrument
<b>Attenuation</b>			
0 to 111 dB	DC to 1 MHz	$\pm 2\%$	dB Step Attenuator (Systronics)
0 to 110 dB	DC to 1 MHz	$\pm 0.25$ dB	MF Attenuator (Radart)
0 to 132 dB	DC to 250 MHz	$\pm 0.2$ dB	R.F. Attenuator (Radart)
0 to 142 dB	DC to 1 GHz	$\pm 0.5\%$ to $1.5\%$	u.H.F Attenuator (Marconi)
<b>Frequency (Source)</b>			
Audio Frequency	1 Hz to 110 KHz	$\pm 3\%$	Audio Generator (Aplab)
H. F.	10 KHz to 72 MHz	$\pm 1\%$	Standard Signal Generator (English Electric)
V. H. F.	0.2 MHz to 220 MHz	$\pm 1\%$	AM/FM Sig. Generator (English Electric)
V. H. F. (Sweep)	1 MHz to 400 MHz	$\pm 2\%$	Sweep/Signal Generator (Wavetek)
<b>Frequency (Counter)</b>			
H. F.	DC to 20 MHz	$\pm 0.1\%$	Digital Frequency Meter (Toshniwal)
V. H. F.	10 Hz to 1000 MHz	$\pm 1$ Count	Frequency Counter (Philips)
V. H. F.	5 Hz to 100 MHz	$\pm 0.1\%$	Multifunction Counter (Data Precision)
<b>Time-Interval</b>			
0.1 $\mu$ sec to 1 sec	—	$\pm 0.1\%$	DFM (Toshniwal)
0.5 $\mu$ sec to 0.2 sec	—	$\pm 1$ count	Multifunction Counter (Data Precision)
<b>Waveform (Generation)</b>			
Sine, Square, Triangular, Ramp, variable phase	0.0008 Hz to 100 KHz	$\pm 1$ div.	Function Generator (Marconi)
Sine, Square, Triangular	0.001 Hz to 1 MHz	$\pm 2\%$	Function Generator (Feedback)
Sine, Square, Triangular	0.001 Hz to 100 KHz	$\pm 3\%$	Function Generator (Systronics)

Parameter and Measurement Range	Frequency	Accuracy	Standard Source/ Measuring Instrument
<b>Waveform (Analysis)</b>			
30 mV to 300 V	20 Hz to 76 KHz	$\pm 1 \%$	Waveform Analyser (Marconi)
.001 V to 10 V	DC to 150 KHz	$\pm 1 \%$	X-Y Display (Wavetek)
<b>Distortion &amp; Noise</b>			
0.1 % to 100 %	20 Hz to 20 KHz	$\pm 3 \%$	Distortion Meter (Marconi)

#### 4.1 Service Charges

Service charges for the use of electronics and electrical instruments depend upon the rates approved by the Department of Electronics, Govt. of India, and the Chandigarh Administration.

#### 4.2 Measurement as per ISI Specifications

a. Components on sample basis	Rs. 25/-
b. Radio (transistor/Valve)	Rs. 25/-
c. T. V. and other items including instruments.	Rs. 100/-

#### 4.3 Calibration

a. All ranges	Rs. 100/-
b. Single Parameter	Rs. 25/-

#### 4.4 Environmental

a. Complete tests	Rs. 100/-
b. Individual test	Rs. 25/-

4.5 Testing/Calibration charges not covered above, for the use of electronics instruments have been tentatively charged at the rate of Re. 1/- per hour as per Rs. 4000/- cost of equipments used, and multiples thereof .

#### 4.6 Mechanical Facilities

Charges are as per SISI approved rates for machinery and equipment used on machine cost and time utilized basis.



4.7 The detailed schedule is detailed below.

<i>Sr. No.</i>	<i>Machines</i>	<i>Rate per hour</i>
1.	Milling (MTR-2, HMT make)	Rs. 10 80
2.	Surface Grinding (Harig)	Rs. 6.60
3.	Turning (a) GD-2 Kirloskar (b) GDW-Voltas	Rs. 5.40
4.	Shaping (DMK make)	Rs. 4.80
5.	Spot Welding Arc Welding	Rs. 4.20
6.	Power Hacksaw Ettumanur	Rs. 3.60
7.	Spray printing and Engraving	As nominal charges

*For further information, please contact :*

Director  
Electronics Testing & Development Centre  
182/18, Industrial Area  
CHANDIGARH-160002      *Tel : 23351*





# GENERAL INFORMATION

## QUALITY MARKING & SERVICE CENTRES IN PUNJAB

### (a) Testing facilities

The Quality Marking Centres of the Punjab Government afford the following facilities at present to the Industrialists :

- (i) testing of raw-materials, required for components semi-finished and finished products for the purpose of approval of goods intended to be quality marked.
- (ii) supply of standard specifications and advice for adopting the same.
- (iii) technical guidance regarding choice of materials, manufacturing processes, testing procedures and standardisation of method.
- (iv) guidance in procurement of raw materials and components.
- (v) supply of designs/drawings and experimentation facilities for producing new types of goods.
- (vi) publicity of quality marked products and their manufacturers.
- (vii) price preference up to 15 percent for government purchases to the manufacturers registered under the Quality Marking Scheme.
- (viii) technical guidance for the production of new items for Defence and Export purposes.

These centres have up-to-date technical libraries, where the latest technical books, catalogues, pamphlets, important foreign and Indian Journals are available for use of the Industrialists.

### List of Quality Marking Centre in the State

Quality Marking Centre (Engg.)	Batala
Quality Marking Centre (Engg.)	Jullundur
Quality Marking Centre (Engg.)	Ludhiana
Quality Marking Centre (Engg.)	Malerkotla
Quality Marking Centre (Engg.)	Amritsar
Quality Marking Centre (Engg.)	Patiala
Quality Marking Centre (Textiles)	Amritsar
Quality Marking Centre (Textiles)	Ludhiana
Quality Marking Centre (Textiles)	Nakodar
Quality Marking Centre (Handicrafts)	Hoshiarpur
Quality Marking Centre (Sport)	Jullundur

Most of the Quality Marking Centres are housed in their own building specifically constructed for this purpose.



The following new Centres have been started during the Fifth Five-Year Plan :

1. Quality Marking Centre (Engg.) Rajpura.
2. Quality Marking Centre (Engg.) Bhatinda.
3. Quality Marking Centre (Engg.) Moga.
4. Quality Marking Centre (Electronics) Ludhiana.

**(b) Servicing Centres**

The department has also established a network of common facility centres in the state to provide facilities for certain specialised processing operations like heat treatment of metals, electroplating, wood seasoning, designing and manufacture of Dies, Jigs, fixtures and electronic instruments and testing of finished as well as in-process jons. The various common facility centres in the state are :

Sl. No.	Name of the Centre	Facilities Provided
1.	Industrial Dev.-cum-Service Centre (Engg.), Amritsar.	Heat Treatment, Machine shop Development and testing of electrical appliances, glass cutting and grinding etc.
2.	Industrial Dev.-cum-Service Centre (Engg.), Jullundur.	Heat Treatment
3.	Industrial Dev.-cum-Service Centre (Engg.), Moga.	Heat Treatment
4.	Industrial Dev.-cum-Service Centre (Engg.), Batala.	Heat Treatment
5.	Industrial Dev.-cum-Service Centre (Engg.), Bassi Pathana.	Heat Treatment
6.	Industrial Dev.-cum-Service Centre (Engg.), Ludhiana.	Anodizing, Heat Treatment, Electroplating, Enamelling, Testing of Engineering and Chemical goods.
7.	Industrial Dev.-cum-Service Centre (Engg.), Patiala.	Machine shop, Development and Testing of Electrical Appliances, manufacturing of Dies, Jigs, fixtures and prototype samples etc.
8.	Industrial Dev.-cum-Service Centre (Electronics), Jullundur.	Development and Testing of Radio and Electronic instruments.
9.	Industrial Dev.-cum-Service Centre (Textile), Ludhiana.	Dyeing, bleaching and finishing of Textile and Hosiery fabrics.
10.	Wood Seasoning Plant, Kartarpur	Wood Seasoning and Preservation.
11.	Wood Seasoning Plant, Pathankot	Wood Seasoning and Preservation.

Besides the above, the following new Centres have been established :

1. Industrial Dev. Centre (Engg.), Bhatinda.
2. Industrial Dev. Centre (Role Grinding), Gobindgarh.
3. Industrial Dev. Centre (Agricultural Implements), Hoshiarpur.
4. Industrial Dev. Centre (Grinding), Batala.
5. Industrial Dev. Centre (Paints & Varnish), Amritsar.
6. Industrial Dev. Centre (Rubber Goods), Jullundur.
7. Industrial Dev. Centre (Plastic Moulds), Ludhiana.

**(c) Features of facilities offered—who are the beneficiaries  
—experience**

The facility offered have been enumerated above. Beneficiaries of these facilities are all the industrial units in the State. This scheme have helped the industry in the Standardisation of their product.



## LIST OF ASSOCIATIONS IN PUNJAB

### District Amritsar

1. Amritsar Coal Consumers Association, Jawala Flour Mills, Amritsar.
2. Punjab Coal Consumers Association, Kanpur Building, Bazar Pashamwala, Amritsar.
3. Amritsar Rubber & General Industries Association, 35-A, Mori Ganj, Amritsar.
4. Amritsar Foundry Association, 196 Mohan Nagar, Amritsar.
5. Textile Manufacturers Association, 4 Dewan C. Mehra Road, Box No. 79 Amritsar.
6. Cottage Industries Association, Amritsar.
7. Nawankot Powerloom Association, Shastri Market, Amritsar.
8. Textile Manufacturers Association, Katra Ahluwalia, Amritsar.
9. Amritsar Small Scale Art Silk Manufacturers Association, Opp. Gole Bagh, Amritsar.
10. Amritsar Textile Association, Katra Ahluwalia, Amritsar.
11. Village Handloom Cloth Manufacturers Association, Golden Temple Road, Amritsar.
12. Tarn Taran Hath Khadi Association, Kapoor Store, Naya Bazar, Tarn Taran.
13. Handloom Shoddy Weavers & Processors Association (Regd.), Katra Ahluwalia, Amritsar.
14. Swadeshi Handloom Shoddy Manufacturers Association, Amritsar.
15. Grey Hand Knitting Yarn Association, Amritsar.

### District Bhatinda

16. District Bhatinda Small Scale Industries Association, P. Box No. 62, Bhatinda.
17. Bhatinda District Small Scale Industries Association, Mansa, District Bhatinda.
18. Small Scale Industries Association, Mansa.

### District Faridkot

19. Small Scale Industrial Coal Consumers Association, Jaitu.
20. District Faridkot Industrial Coal Consumers Association, C/o Jai Bharat Steel Rolling Mills, Jaitu.
21. Ferozepur-Moga Industrial Coal Consumers Association, G. T. Road, Moga.
22. Moga & Agricultural Implements Manufacturers Association, Akalsar Road, Moga.

### District Ferozepur

23. Ferozepur Moga-Industrial Coal Consumers Association, Gobind Nagari, Ferozepur City.

### **District Gurdaspur**

24. Batala Industrial Estate Factories Association, Batala.
25. Batala Foundry Industries Association, Railway Road, Batala.
26. Batala Manufacturing Association, Batala.
27. Factories Association, Railway Road, Batala.
28. Northern India Engineering Association, G. T. Road, Batala.
29. Small Scale Industrial Association, Kashmir Road, Batala.

### **District Hoshiarpur**

30. Hoshiarpur District Small Scale Industries (Iron & Steel) Association, Purani Sabzi Mandi, Hoshiarpur.
31. Hoshiarpur Rosin Manufacturers Association, Bharwain Road, Hoshiarpur.
32. Hoshiarpur Handicrafts Manufacturers Association, C/o M/s Dhani Ram Puran Chand, Dabhi Bazar, Hoshiarpur.
33. Hoshiarpur District Textile Manufacturers Association, 114, Industrial Estate, Hoshiarpur.
34. Federation of Small Scale Industries C/o Shri Bhagwant Singh Ahluwalia, Chhani Farm, Hoshiarpur.
35. New Focal Point Area Industrial Association C/o M/s Shiv Metal Industries, Purani Sabzi Mandi, Hoshiarpur.
36. Hoshiarpur District Industrial Development Association, 37, Industrial Development Colony, Hoshiarpur.

### **District Jullundur**

37. Jullundur Industries Association, Industrial Area, Jullundur.
38. Jullundur Rubber Goods Manufacturers Association, Kotwali Bazar, Jullundur City.
39. Jullundur Pipe Fitting Manufacturers Association, Hoshiarpur Road, Jullundur.
40. Jullundur Industries & Exporters Association, S-117, Industrial Area, Jullundur.
41. Jullundur Hand Tool Manufacturers Association, E-37, Industrial Area, Jullundur.
42. Jullundur Tools Manufacturers Association, WG 246, Islamabad, G. T. Road, Jullundur City.
43. New Small Scale Manufacturers Association, S-170, Industrial Area, Jullundur.
44. Allied Tools & Implements Manufacturers & Exporters Association, Basti Danishmanda, Jullundur.
45. Auto Spare Accessories Manufacturing Association, 984, Preet Nagar, Jullundur.
46. United Hand Tools Manufacturers Association, Basti Danishmanda, Jullundur.
47. Hand Tools Exporters Manufacturers Association, Basti Sheikh, Jullundur.



48. East Punjab Manufacturers Association, Preet Nagar, Tanda Road, Jullundur.
49. Sun Beam Industrial Exporters Association, E-S-415, Abadpura, Jullundur City.
50. Jullundur Sewing Machine Parts Manufacturing, Jullundur.
51. Punjab Small Scale Industrial & Federation, Nai Abadi, 72, Jaur Pull, Jullundur.
52. Federation of Industrial Association, Jullundur.
53. Jullundur Oil & Silicats Manufacturers Association, Parton Ganj, Jullundur.
54. Northern India Brass Cock Manufacturing Association, Preet Nagar, Jullundur.
55. Goraya-Phillaur Industries Association, Amar Building, G. T. Road, Goraya.
56. Goraya Regd. Factories Owners Association, Goraya.
57. Jullundur Steel Rolling Mills Association, Jullundur.
58. Northern India Switchgear Manufacturers Association, Nakodar Road, Jullundur.

#### **District Kapurthala**

59. Kapurthala Industries Association, Factory Area, Kapurthala.
60. Oil Allied Industries Association, Kapurthala.
61. Phagwara Steam Coal Consumers Association, Phagwara.
62. Phagwara Auto Spare Manufacturers Association, Phagwara.
63. Phagwara Industrial Association, Phagwara.

#### **District Ludhiana**

64. Ludhiana Coal Consumers Association, 527, Railway Road, Ludhiana.
65. Ludhiana Coal Consumers Guild, 430, Industrial Area 'B', Ludhiana.
66. Ludhiana Factories Association, near Clock Tower, Ludhiana.
67. Punjab State Factories Association, 391-A, Industrial Area, Ludhiana.
68. Ludhiana Machine Tools Makers Guild, 510, Deep Road, Industrial Area 'B', Ludhiana.
69. Northern Indian Engineer Exporters Association, Kucha Ahluwalia, Ludhiana.
70. Ludhiana Motor Parts Manufacturers Association, Ludhiana.
71. Ludhiana Engineering Industries Association, Ludhiana.
72. Ludhiana Gurciable & Couploa Association (Regd.), Oswal Market, G. T. Road, Miller Ganj, Ludhiana.
73. Dyeing Factory Association, B-III-318, Kucha Beli Ram, Ludhiana.
74. Ludhiana Foundry Owners Association, G. T. Road, Miller Ganj, Ludhiana.
75. United Cycle & Parts Manufacturers Association, Gill Road, Miller Ganj, Ludhiana.

76. Oil Expellers Manufacturers Association, G. T. Road, Ludhiana.
77. Shri Jagjit Singh Shad, President, Ludhiana Focal Point, Industries Association, Aroma Building, Dhandari Kalan.
78. Handloom Manufacturers Welfare Board Association, Ludhiana.
79. Suttlej Art Silk Manufacturers Association, Ludhiana.
80. Art Silk Staple Powerlooms Association, Hazoori Road, Chowk Madhopuri, Ludhiana.
81. Staple & Cotton Hosiery Manufacturers Federation, Chawal Bazar, Ludhiana.
82. Punjab Small Scale Manufacturers Association, Ludhiana.
83. New Inter-Lock & Sinker Cloth Manufacturers Association, 118, Khud Mohalla, Ludhiana.
84. Banian Manufacturers Association, Chawal Bazar, Ludhiana.
85. Knitter Association Regd., Shiv Dayal Street, Uchi Gali, Ludhiana.
86. Sinker & Inter-Lock Cloth Manufacturers Association (Regd.), Islamia School Road, Ludhiana.
87. Ludhiana Rayon & Manufacturers Association, Ahata Sher Singh, Ludhiana.
88. Textile Manufacturers & Export Association (Regd.), Ghas Mandi, Ludhiana.
89. Suttlej Art Silk Manufacturers Association, Islamia School Road, Ludhiana.
90. Small Powerlooms Weavers Association, Madan Niwas, Bagh Bali Gali, Ludhiana.
91. Textile Units Association, Ghas Mandi, Ludhiana.
92. Art Silk Staple Powerloom Association, Ahajuri Road, Ludhiana.
93. Punjab Textile Units Association, Purani Kotwali, Chaura Bazar, Ludhiana.
94. Wool & Woollen Export Promotion Council (Original Office), DC's residence Road, Ludhiana.
95. Hosiery Industry Federation (Apex of Hosiery) Manufacturers Satsang Ghar Road, Civil Line, Ludhiana.
96. Northern India Hosiery Manufacturers Corporation (Regd.), C/o 38, Lakshmi Hosiery, Civil Line, Ludhiana.
97. Hosiery Manufacturers Association, Beri Road, Civil Lines, Ludhiana.
98. Bharat Hosiery Manufacturers Association, Chowk Saidan, Ludhiana.
99. United Hosiery Manufacturers Association, Arya Samaj Mandir, Dal Bazar, Ludhiana.
100. Hosiery Industry Welfare Board, Ludhiana (Hindi Bazar).
101. Home Hosiery Manufacturing Union, Chawal Bazar, Ludhiana.
102. Apra Hosiery Manufacturers Association, Apra (Jullundur) Office, Madhopuri-I, Ludhiana.
103. Art Silk Staple Powerloom Association (Regd.), Hazoori Road, Ludhiana.
104. Actual Hosiery Manufacturers Association (Regd.), Hazoori Road, Ludhiana.



105. Ludhiana Hosiery Small Scale Union (Regd.), Katra Nauharian, Ludhiana.
106. Star Hosiery Small Scale Union, Chowk Saidan, Ludhiana.
107. Silver Hosiery Small Scale Union, Hazoori Road, Ludhiana.
108. Mahavir Hosiery Manufacturers Association (Regd.), Purana Bazar, Ludhiana.
109. District Hosiery Co-operative Society Federation Ltd., Prem Gali, Dares Road, Ludhiana.
110. Punjab Small Scale Manufacturers Union (Regd.), 1164, Madhopuri-I, Ludhiana.
111. Dyeing Factory Association, Matarani Road, Ludhiana.
112. Hosiery Machine Manufacturers Association, Miller Ganj, 'B', Ludhiana.
113. Industrial Sewing Machine Manufacturers Association, Industrial Area, 'A', Ludhiana.

#### **District Patiala**

114. Mandi Gobindgarh Steam Coal Consumers Association, Amloh Road, Mandi Gobindgarh.
115. Re-Roller Coal Consumers Association, Babu Ram Harnam Dass Building, Railway Road, Mandi Gobindgarh.
116. Re-Roller's Council of India, Guru Nanak Building, Mandi Gobindgarh.
117. Food & Forging Coal Consumers Association, G. T. Road, Mandi Gobindgarh.
118. Gobindgarh Agriculture Implements Manufacturers Association C/o M/s Uplift Engineering Works, Mandi Gobindgarh.
119. Factory Area Industries Association, Patiala.
120. Patiala Industries Association, Patiala.
121. Trunk Balti Association, Rajpura.
122. Focal Point Industries Association, D-22/23, Industry Focal Point, Rajpura.

#### **District Rup Nagar**

123. Mohali Industries Association, D-45, Industrial Focal Point Association, SAS Nagar, Mohali.

#### **District Sangrur**

124. Sangrur District Coal Consumers Association, Dhanaula Road, Barnala.
125. Malerkotla Small Scale Industries Association, Industrial Estate, Malerkotla.
126. Malerkotla Project Area, Rural Industries Association, Malerkotla.

## INDUSTRIES ASSOCIATION OF CHANDIGARH (REGD.)

247, Industrial Area, Chandigarh-160002

### LIST OF MEMBERS

Sl. No.	Name and address of the Firms	PHONE	
		Office	Res.
1.	A. H. Engineering Works 184, Industrial Area	26630 27168	29950 28708
2.	Allied Carbon Products 252, Industrial Area	21131 PP	20900
3.	Alvind Industries 212, Industrial Area	25513 29382	27158
4.	Ambika Plastics Private Limited 104, Industrial Area	28069	20040
5.	Ashin Tiles Corporation 41-M. W., Industrial Area	28666	27311
6.	Avery Free Wheel Private Limited 23-A, Industrial Area	25002	25227
7.	Baij Nath Asharfi Lall 164, Industrial Area	23828 23297	26672
8.	Bajaj Industrial Corporation 13, Industrial Area	25836	
9.	Baku Oil Company 225, Industrial Area	21432	23673 28571
10.	Bhushan Industrial Co. Pvt. Ltd. 3, Industrial Area	20297 26683	20816
11.	Bolaria Foods and Farms (P) Ltd. 157, Industrial Area	29331	27061
12.	Brothers Associates 218, Industrial Area		27958
13.	Capital Cold Storage 25, Industrial Area	26332	23773
14.	Capital Ice Factory 16, Industrial Area		23335
15.	Chandigarh Gas Company Pvt. Ltd. 75, Sector 5, Chandigarh		24395
16.	Chandigarh Motors 4, Industrial Area	27449	20516
17.	Chandigarh Paper Board Mills Pvt. Ltd. 26, Industrial Area	23586	23287 25536
18.	Chandigarh Spun Pipe Company 29, Industrial Area	23879 27495	26542
19.	Decor Steel Private Limited 71-72, Industrial Area	23791	26424



Sl. No.	Name and address of the Firms	PHONE	
		Office	Res.
20.	Delhi Cold Storage 33, Industrial Area	28659	23347
21.	Devasar Engineers Private Limited 43, Industrial Area	25865	23167
22.	Devindra Engineering Works 211, Industrial Area	27918	24982 20200
23.	D. K. Industries 36, Industrial Area	23247	26754
24.	Electro Acoustical Industries 216, Industrial Area	25514	28934
25.	Electronic Products of India 373, Industrial Area	20437	27758
26.	Equipment De Chandigarh 254, Industrial Area	20067	20949
27.	Essen Deinki 368, Industrial Area	28826 27957	28493 26885
28.	Fertichem (India) 331, Industrial Area		29422
29.	Friends Engineering Works 705, Industrial Area	29612	21916
30.	Garg Industrial Corporation 359, Industrial Area	25882	
31.	Groz-Beckert Saboo Limited 133-134, Industrial Area	28531 28532	28074 25444
32.	Hesbee Machine Tools 153, Industrial Area	23384	
33.	Indian Harness Industries 251, Industrial Area	20266	23850
34.	Janta Cold Storage & Industries 31, Industrial Area	20417	
35.	Kalsityre (Chandigarh) Pvt. Ltd. 102, Industrial Area	26656 20916	28640
36.	Kapur Ice Factory 82, Industrial Area	23639	
37.	Khanna Industries 121, Industrial Area	26523	26557
38.	Kiran Industries 189-A, Industrial Area	23266	24930
39.	Kuldip Industrial Corporation 41, Industrial Area	23251	26738
40.	Kumar Chemicals 108, Industrial Area	28498	
41.	Meters & Instruments Limited 143, Industrial Area	23857 27127	24482 24601

Sl. No.	Name and address of the Firms	PHONE	
		Office	Res.
42.	Modella Woollens Limited 181, Industrial Area	25351 26055	26292 24077
43.	Modern Automobiles Engineers 4, Motor Market, Industrial Area	25811 23079	23380
44.	National Industrial Corporation 10-M. W., Industrial Area	29119 21435	23679 25103
45.	National Machine Tools 184, Industrial Area	27168	28708
46.	National Radio & General Stores 315, Industrial Area	26905	
47.	N. C. I (India) Private Limited 105, Industrial Area	23936 23981	23375 23672
48.	New Allied Capital Industries 27, Industrial Area	28026 23586	23287 25536
49.	New India Rubber Works 3-M. W., Industrial Area	20857	
50.	Nijsons 79, Industrial Area		24050
51.	Nikko Kogyo 34, Industrial Area	25085	26556
52.	Northern India Chemical Industries 665, Industrial Area	29182	20731 26786
53.	Oriental Cable Company 219, Industrial Area	20150	29439
54.	Pasco Motors 177-D, Industrial Area	26948 27463	24904
55.	Pfizer Limited 178, Industrial Area	25295 23047	26249 27331
56.	Precto Engineers 188-B, Industrial Area	27193 24556	26643
57.	Punjab Beverages Limited 180, Industrial Area	27104 28421	23291
58.	Punjab Waste Plant Company 92, Industrial Area	25466	20563
59.	Ravi Mohan Industries 170, Industrial Area	24782	25418
60.	R. Chemicals & Fertilisers 334, Industrial Area	21341	
61.	R. K. & Company 228, Industrial Area	21340	24954
62.	Sharma Engineering Corporation 174, Industrial Area	28857	
63.	Steel Sales (India) Private Ltd. 131, Industrial Area	24940	23382 23809



Sl. No.	Name and address of the Firms	PHONE	
		Office	Res.
64.	Surjeet Industries 117-118, Industrial Area	23248	25794
65.	Suvirs Tiles 14, Madhya Marg, Sector 7-C	27973	23233
66.	Varma Precisions 116, Industrial Area	25150	
67.	Vineet Industries 170, Industrial Area	24785 PP	23608

## LIST OF MEMBERS OF THE HIMACHAL CHAMBER OF COMMERCE AND INDUSTRY

Sl. No.	Address	Activities
1.	M/s Farm Fresh Foods Pvt. Ltd., Bata Mandi, Paonta Sahib (HP)	R. C. C. Spun Pipes
2.	M/s K. K. Anand, Bata Mandi, Paonta Sahib (HP)	Hydrated Lime
3.	M/s Ram Prakash & Sons Bata Mandi, Paonta Sahib (HP)	Lime Stone, Quarries & Dolmotite
4.	M/s Himachal Mines and Quarries Bata Mandi, Paonta Sahib (HP)	Hydrated Lime & Calcium Carbonate
5.	M/s Himachal Minerals and Chemicals, Bata Mandi Paonta Sahib (HP)	Baryte Powder
6.	M/s The Jesico Metalware Factory Bhadri Nagar, Paonta Sahib (HP)	Mfr of S. S. utensils & Brass utensils
7.	M/s Shivalik Metal Industries Bhadri Nagar, Paonta Sahib (HP)	Mfr of S. S. & Brass utensils & Zinc Oxide
8.	M/s Himachal Shoddy Mills Bhadri Nagar, Paonta Sahib (HP)	Mfr of Shoddy Yarn
9.	M/s Sanjeevineeta Gupta Mills Devi Nagar, Paonta Sahib (HP)	Mfr of Woolen blankets etc.
10.	M/s Triloksons Breweries Kala Amb, Nahan (HP)	Mfr of all kind of wines
11.	M/s Himachal Foods Products Kala Amb, Nahan (HP)	All kind of wines
12.	M/s Sirmur Foundry Works Nahan (HP)	Mfr of all kind of C. I. castings
13.	M/s P. A. Pinions Dharampur (HP)	Spare of watches
14.	M/s Mohan Meakin Breweries Ltd. Solan (HP)	Mfr of all kind of wine

Sl. No.	Address	Activities
15.	M/s United Himachal Motors Mandi (HP)	Dealer in Automobile
16.	M/s Everest Store Mandi (HP)	Dealer in Cement
17.	M/s Delhi Packaging Pvt Ltd Solan (HP)	Packing boxes
18.	M/s Krishna Rosin and Terpentine Factory, 7, Anaj Mandi, Simla (HP)	Terpentine Factory
19.	M/s Khanna Traders Nagrota Bhagwan, Kangra (HP)	Dealer in Sanitary Ware
20.	M/s Virendra Hotel & Allied Industries, Simla (HP)	Hotel owner
21.	M/s Gulsharan Rai Baweja & Sons Paonta Sahib (HP)	Petrol Pump owner
22.	M/s Thirani Chemicals Ltd Paonta Sahib (HP)	Mfr of Calcium Carbonate
23.	M/s Prem Sagar & Sons Mandi (HP)	Mfr of Calcium Carbonate
24.	M/s Hesbee and Co. (Regd.) Mandi (HP)	Mfr of Guns
25.	M/s Laboratories Supplier Simla Road, Mandi (HP)	Dealer in Scientific Instruments
26.	M/s Cousins Gun Manufacturers Mandi (HP)	Mfr of Guns
27.	M/s Ashoka Steel Furniture Industries, Mandi (HP)	Mfr of Furniture
28.	M/s Jaimal Singh & Sons Gandhi Chowk, Mandi (HP)	General Merchant
29.	M/s Gurcharan Singh Satpal Singh Mandi (HP)	Dealer in Fruits & Vegetables
30.	M/s Tara Chand Malhotra & Sons Indian Explosive Ltd, Mandi (HP)	Explosive
31.	M/s Bhagat Singh Waryam Singh Gandhi Chowk, Mandi (HP)	General Merchant
32.	M/s Diloo Ram & Sons Mandi (HP)	Dealer in Food grain
33.	M/s Dina Nath & Sons Gandhi Chowk, Mandi (HP)	General Merchant
34.	M/s H. S. Engineering Works 145/12, Ram Nagar, Mandi (HP)	Mfrs of Shutter
35.	M/s Navrang Store Bazar Bhut Nath, Mandi (HP)	Mfr of Wool & Readymade garments
36.	M/s Nand Lal & Sons, Mandi (HP)	General Merchant
37.	M/s Ganesh Paints Works Una (HP)	Mfr of Paints



Sl. No.	Address	Activities
38.	M/s Gobind Printing Press Bhadri Nagar, Paonta Sahib (HP)	Printing Press
39.	M/s Saklani Chemicals Industries Paonta Sahib (HP)	Mfr of Acid Sturry and pre pates Chalk
40.	M/s Mahesh Saran & Sons, Nahan	General Store
41.	M/s Sunder Lal Som Dutt, Delhi Gate, Nahan (HP)	General Merchant
42.	M/s Babu Ram Bansal & Sons Nahan (HP)	Garment Merchant
43.	M/s Meenu Engineering Works Spatu Road, Dharampur (HP)	Mfr of bifericated rivets
44.	M/s International Angore Breeding Farm, Mohal—Kulu (HP)	Mfr of wool
45.	M/s High 'Q' Papers, Majra (HP)	Mfr of Papers
46.	M/s Limbux Enterprisers, Paonta Sahib (HP)	Mfr of Lime
47.	M/s Jagjit Bros, Nagrota Bhagwan (HP)	Transporter
48.	M/s Ravindra Industries, Bhadri Nagar, Paonta Sahib (HP)	Mfr of Polypropelene Box strappings
49.	M/s Garga Enterprisers, Bhadri Nagar, Paonta Sahib (HP)	Stainless Steel production
50.	M/s Garga Steel Industries, Bhadri Nagar, Paonta Sahib (HP)	Stainless Steel Ingots & Allo Steel castings



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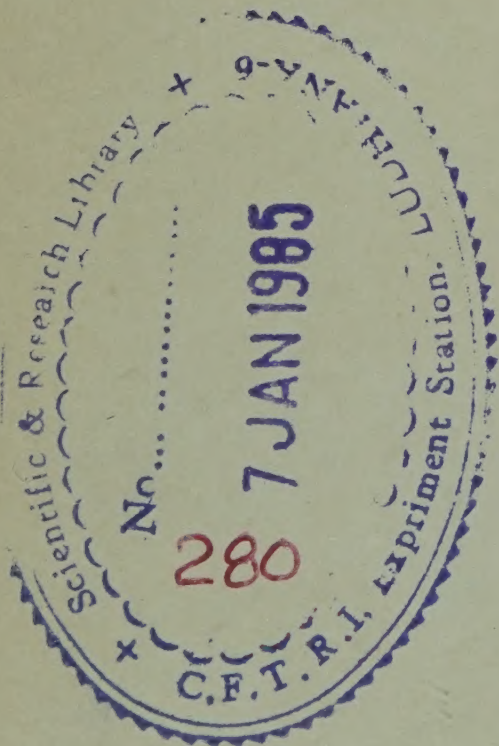
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- (ii) Advances to small scale industrial units on their own account for improving their techniques of production or the quality or the range of their production provided such equipments are not used for the unit's productive activity or quality control or testing. Investment on such equipment would also not be included in the computation of value of its plant and machinery.

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